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Best Practice in Service and Meter Wiring

Location, Wiring, Grounding and Protection of Service and Meters on Customer's Premises—Precautions to Be Taken—Advantages of Full Iron-Clad Wiring

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PRACTICALLY all of the larger electric central-station companies issue rules and regulations to which wiring contractors must adhere in doing construction work for customers to be connected to the company's mains. The enforcement of these rules not only protects the interests of consumers, but also makes it certain that these regulations, which the company's experience has shown to be necessary, are fully carried out.

Where such rules are in force it is usual to furnish wiring contractors with blank notices and reports, such as the one shown in Fig. 2, which must be carefully filled out for each installation, and filed at the company's office before the actual work is started.

In no case should a contractor be allowed to make the service connection to the company's lines. This right should be reserved by the company in order to protect its interest.

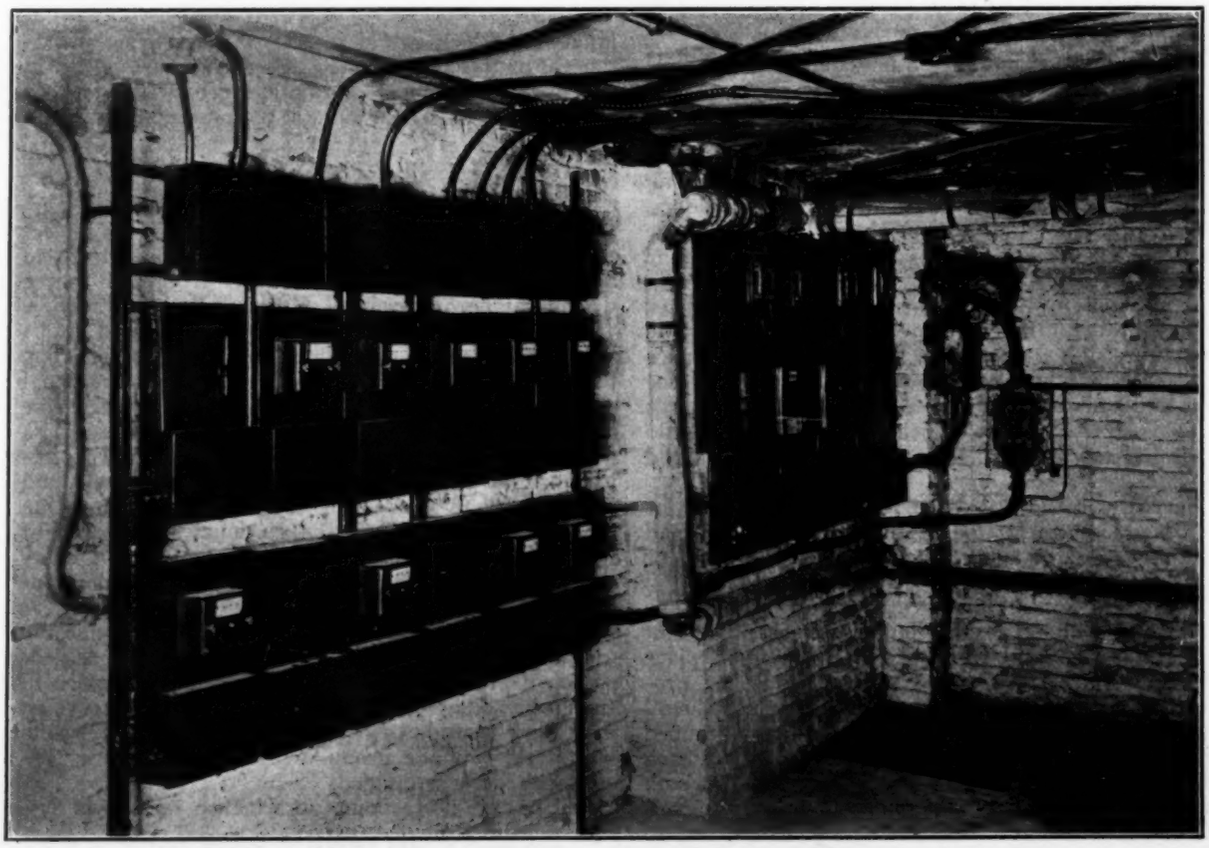


Fig. 1.—A Typical Iron-Clad Meter Installation. Compare With Fig. 7, Which Shows Same Installation in Original Condition.

It is usual for the contractor to install all wiring from a point at least two feet outside of the service condulet to and including the service cutout switch. Service wires should be installed in iron conduit to a point outside of the building most convenient to the company's mains.

The contractor should furnish conduit and wires which should extend up the side of the building at least 15 feet above the ground, and terminate at such a point as not to interfere with windows, awnings or other parts of the building. The conduit must never terminate where the unprotected wires may be dangerous to life. The conduit should be provided with an approved entrance fitting with insulating bushing and drip loop. In Figs. 3 and 4 are shown proper and improper methods of making service connections.

Where it is desired to supply current from underground mains, the customer's wiring should terminate and the meter board be placed at the front wall of the cellar or vault nearest the street. When the wiring is done by local contractors and the service is not actually being supplied from subways at the time service is desired, the central-station company sometimes requires an additional temporary overhead service to be installed until the underground system is provided.

Location and Mounting of Meters.

Meters should be located in the cellar, as near as possible to the point of entrance of the service, in a clean, dry, safe place, free from vibration and not subject to great variation in temperature. The top of the meter board should not be more than six feet, nor the bottom less than four feet above the floor, or above a suitable platform placed underneath the meter, where it will be easily accessible for reading and testing.

In every case where the main switch and cutout is situated at a distance from the meter, an additional main switch should be placed ahead of the meter at the meter location. Under no circumstances should meters be placed in coal or wood bins or on partitions forming these bins.

Where buildings have no cellars, or where the cellar is damp or not easily accessible, the meter should be installed on the first floor.

Meters should not be installed in attics, sitting rooms, bath rooms, bed rooms, kitchens, over doors, over windows, or any location where the visits of the meter reader or tester will cause annoyance to the customer.

It is usual for the contractor to furnish a meter board with about 18 by 18 inches clear space for the meter only, and so located as to allow sufficient space on all sides of the meter to permit of removing the cover and calibrating the meter. When meter boards are fastened to walls a two-inch clearance space should be allowed for the circulation of air between wall and board.

Service wires must be so arranged that they can be connected to the left side of the meter and the load wires to the right side without crossing them at or near the meter board.

Where two or more meters are to be placed in one installation, such as an office building or an apartment house, they should be grouped at a common place accessible for reading. Each meter should be protected by an individual switch and cutout which should be placed in an iron box. Where meters are so grouped it is desirable to designate the circuit to which each applies. This is best accomplished by tagging both the service and load wires connected to each meter. One meter must never be placed nor connected to include the reading of another meter nor should apparatus or lamps be connected to feed one leg through one meter and one leg through another meter.

Meters should never be placed where they will be subjected to extreme temperatures or outside electrical

CONTRACTOR'S REPORT.

Town .....

No. ..... Street .....

Name .....

Character of Building:—BRICK, STONE, FRAME, IRONCLAD. (underline word giving character of building.)

Occupied as .....

Work will be commenced 191

Work will be ready for preliminary inspection (rough wiring complete) 191

Work will be completed (all fixtures installed ready for connection) 191

Fixtures connected by .....

New Installation ..... Lights, ... Motors, ...

Additional Installation ..... Lights, ... Motors, ...

Total Installation ..... Lights, ... Motors, ...

SPECIFICATION.

NATURE OF WORK.—OPEN MOULDING,
CONCEALED.—Knob and Tube, Loom, Iron Conduit (underline.)

KIND OF FIXTURES.—PENDANTS, RECEPTACLES, ELECTROLIERS, COMBINATION, ARCS (underline.)

SERVICE CONNECTION.—OVERHEAD OR UNDERGROUND, TWO WIRE OR THREE WIRE (underline.)

SERVICE OUTLETS, located .....

METER to be located .....

FLOOR	NUMBER OF					SIZES OF			INSULATION	OPEN OR CONCEALED	LOCATION OF CUT-OUTS	No. OF CIRCUITS
	OUTLETS	INC. LOOPS 14 G. P.	INC. LOOPS G. P.	ARCS	FANS	PICTURE	WIRES	ENGINE				
Cellar,												
Basement,												
1st Floor,												
2nd "												
3rd "												
4th "												
5th "												
6th "												
Attic,												
Outside,												

Greatest Number of Lamps on one Branch .....

MOTORS.—Maker ..... Type ..... Voltage ..... Amperes ..... H. P. ..... Location .....

REMARKS. .....

Electrical Contractor.

Date ..... 191 ..... Address.

☞ This Blank Must be Carefully Filled Out and sent to the Local Office of the Company when Wiring is Commenced.

Fig. 2.—Typical Form for Wiring Contractor's Report.

influences which would interfere with their registration. For this reason no meters should be installed in the operator's rooms of motion-picture theaters or within five feet of an electric motor or large masses of iron.

Grounding of Secondaries.

The grounding of secondary circuits is for the purpose of providing protection to human life from electric shock. The grounding of the secondary leads to a harmless point all stray currents from any source which may become crossed with the secondary service.

As early as 1900 this practice was found to be beneficial by actual experiment and test, and in 1905 the subject was discussed in meetings of the national electrical engineering societies. From that date the practice of grounding secondaries became more or less general; beginning with 1907 various engineering organizations recommended the practice as desirable, and in 1914 such organizations as the American Institute of Electrical Engineers, the National Electric Light Association, and the National Board of Fire Underwriters recommended that the practice be made mandatory.

The secondary voltage value should determine the question of when to ground the service, and it is now standard practice to ground all secondary service in the lower voltage group, up to and including 300 volts, with the exception of certain polyphase power circuits within this voltage group, which, for operating reasons, are left ungrounded.

There are three points at which a secondary system may be grounded, namely,

At the generating station,
At the transformer,
On the customer's premises.

If the generating-station grounding point is used, it is necessary to have the overhead grounded wire running over all the lines carrying the secondary system, which subjects linemen and overhead workers on pole lines to an unnecessary hazard, brought about by the presence of this grounded wire within the zone of their operations on the pole. This practice, from an operating standpoint, is considered undesirable. Moreover the breaking or disconnection of this wire removes all protection.

If the second, or pole-transformer, point for grounding is used, the overhead system is relieved of the hazard just described and the secondary service receives considerable protection, as theoretically any stray current getting onto the circuits will be led to the ground through the grounding wire run from the transformer on the pole to the ground at that point, but this method does not give the greatest protection to the user of electrical energy.

The third and only complete method from the protection standpoint is to ground within the customer's premises, so that the location of the point of protection will be as near as possible to the person subject to the electrical hazard, thus protecting the user from the stray currents occasioned by the crossing of wires from any cause, even though such cross occurs immediately outside of the building served. Such grounds are free from disturbance from any outside cause.

It has been clearly demonstrated that an unreliable ground is most undesirable from a protection standpoint and that a ground of minimum resistance and maximum permanency gives the most complete protection. Therefore, the practice of grounding to active underground water-piping systems affords the most perfect ground connection, and by placing such connection immediately within the walls of a building served ahead of any water meters or accessories a protective connection is secured at the point nearest to the user of the electrical energy and at a point which can best be guarded for permanency of the connection.

Several years' experience throughout the United States with thousands of cases of connections as just described proves conclusively that a connection of this nature is in no way harmful to the water-piping systems. It is fortunate that this fact is recognized by nearly all of the water-distributing companies throughout the country, because the continuity of a good ground connection is essential for continued protection, and the locating of the protective connection just within the walls of a building, as described, makes the guarding and inspection of such work easy of accomplishment. This, combined with the desirability of having the ground connection as near as possible to the user of the current, makes this point of grounding the most logical for good results. This is a standard method and is fast becoming the general practice in this country.

In Fig. 5 is shown a ground connection on a three-wire installation. The ground wire should be a continuous wire without joints, and of a sufficient length to be connected to the service side of the main line fuses. The ground wire should be at least as large as

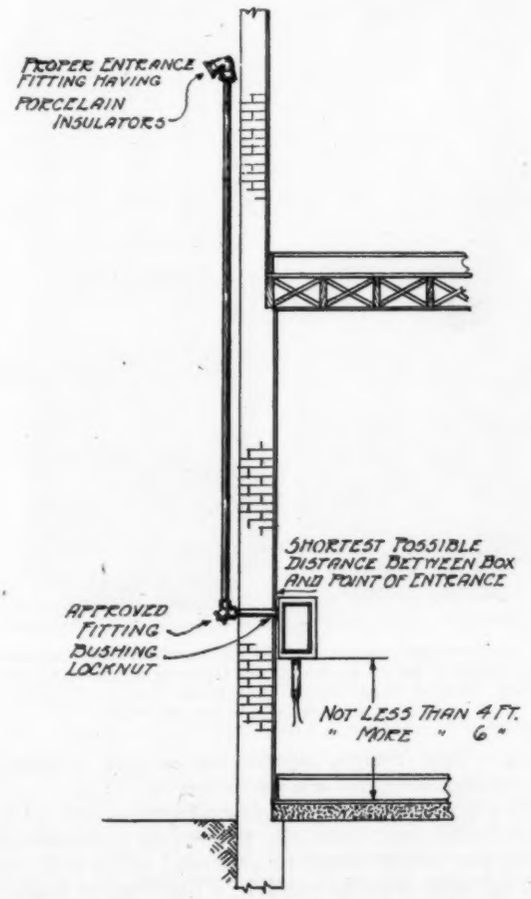

PROPER ENTRANCE FITTING HAVING PORCELAIN INSULATORS
SHORTEST POSSIBLE DISTANCE BETWEEN BOX AND POINT OF ENTRANCE
APPROVED FITTING
BUSHING
LOCKNUT
NOT LESS THAN 4 FT.
" MORE " 6"

Fig. 3.—Proper Method of Making Service Installation.

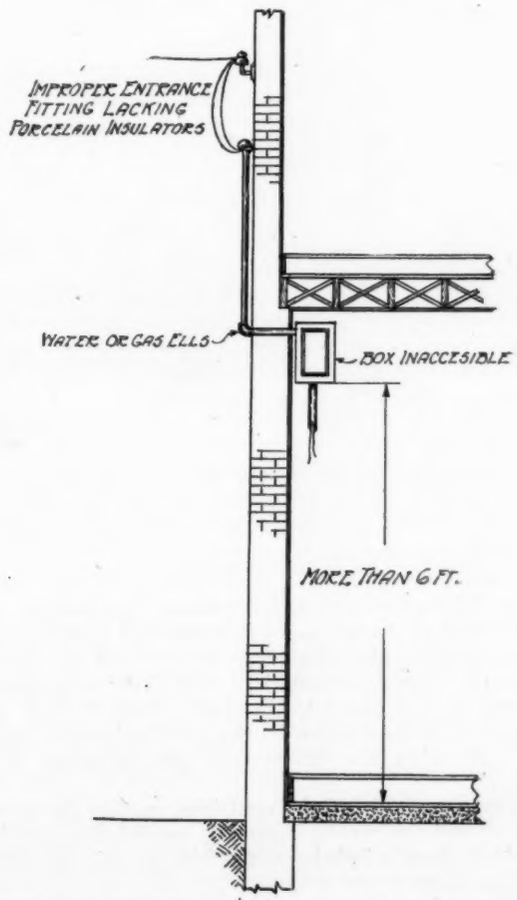
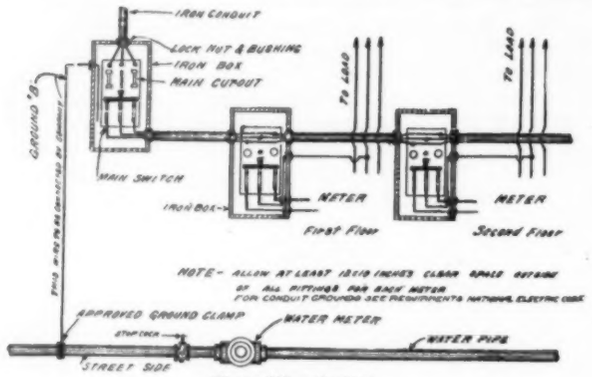


Fig. 4.—Improper Method of Making Service Installation.

the largest wire used for service mains (except that a wire larger than No. 0000 is not necessary), but in no case should it be less than No. 6 B. & S. gauge. When a building is wired in metal conduit the ground wire



Three Wire System

Fig. 5.—Approved Method of Making Ground.

for this conduit must never be connected to the secondary ground wire.

Service Changes.

In changing from overhead to underground distribution it frequently happens that the character of the service is also changed. This applies particularly to some of the earlier installations which were originally designed for direct-current distribution, as well as to cases where the class of power service was changed from single or two-phase to three-phase distribution. Such changes often require the rewiring of customers' installations, as well as a renewal of the equipment to conform to the new class of service.

Where it is necessary for companies to take this step, satisfactory arrangements with consumers will be required in order to change the class of service. The matter of deciding on what is a proper and reasonable procedure in bearing the cost of such new installations is often difficult and frequently leads to dissatisfaction on the part of the customer, with the result that an appeal is made to the local utility commission.

No hard and fast rules can be made to take care of such situations, but the problem is very often solved by making the customer an allowance on the equipment replaced, this usually being based on a certain rate of depreciation of the equipment.

While this arrangement seems to be fair from both the customer's and the company's viewpoint, there have been cases where the customer has borne the entire cost because the benefits resulting from the new class of service would more than offset the expense incurred.

Service Protection.

In the early periods of electric distribution, the service end of the system was somewhat neglected and very little thought was given to the real importance of proper service installation. Services were usually treated as an adjunct to the main system and no special attention was given to the installation as long as the connection was made with the property to be served.

The protection of the watt-hour meter, the service wiring, and the service cutout is one of the questions to which electric lighting companies are giving consideration today.

The sealing of meters dates back quite a number of years when it was realized that if the mechanism and adjustments of the meters were as accessible to the consumer as to the company's representatives, its continued accuracy would be a matter of very serious doubt. The seal was adopted, therefore, as a means of positively indicating when the meter had been opened by some one other than the authorized employees of the central-station company.

The same line of reasoning applies to the protection of the apparatus and wiring on the service side of the meter. While it is a fact that illegal use of energy is generally confined to certain classes of consumers, there are many who, while they would not deliberately remove the insulation and make a permanent illegal connection, would, however, connect a part or all of their equipment to the exposed service switch, cutout or wires when the opportunity offered itself.

In many of the old-time service installations a considerable amount of exposed wire is found unprotected. In such installations the terminal blocks consisted of an ordinary fuse block not protected against short-circuits caused by accidental contact.

The storage of refuse, and in many cases packing boxes containing inflammable material piled near the fuse blocks, increased the fire hazard.

The use of wooden molding in cellars has been condemned by the underwriters, with the result that either open wiring or conduit is used as an alternative, the latter being more generally accepted. It was also ruled that all switches and cutouts be inclosed in iron

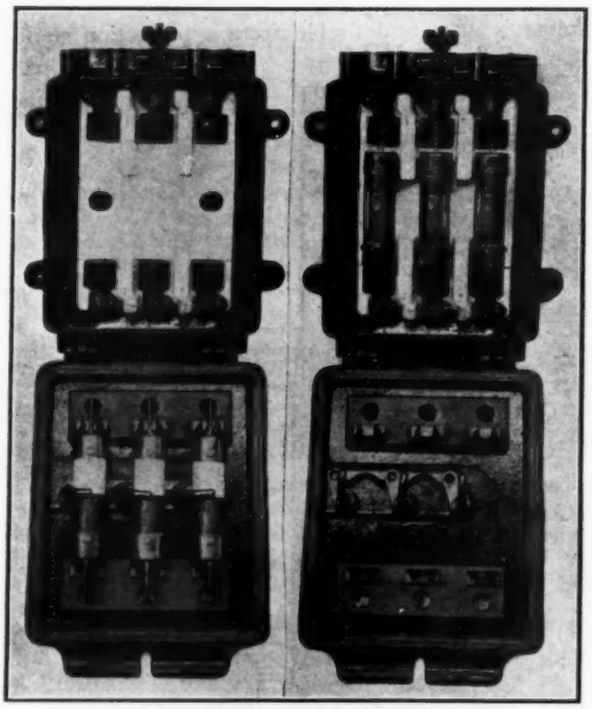


Fig. 6.—Iron-Clad Service Box. First View Shows How Cover Arrangement Serves as Switch for Opening and Closing Circuit. Second View Shows How Cover Can Be Opened Without Disturbing Circuit or Fuses.

boxes. This further tended to prevent fraudulent interference with the service switch and fuses.

In Fig. 6 is shown an approved type of service box which is designed primarily to provide a combination cutout and switch which may be used either with open wire or with wire in conduit. The box is made of cast iron and the cover is provided with a handle which

simultaneously actuates two or three fuse-carrier hooks inside the box.

When the cover is closed it can be sealed to prevent tampering on the part of unauthorized persons. When it is desired to place the fuses in circuit, the handle is turned so that it points downward.

The fuses are then slipped into the alining clips in the cover and the handle turned so that it points toward the right. The cover may then be closed or opened to insert or withdraw the fuses.

If, when the box is closed, it is desired to examine the condition of the fuses without breaking the circuit, it is only necessary to give the operating handle a quarter turn, which leaves the fuses in the contact clips.

The ends of the boxes are so arranged that they may be provided with interchangeable conduit fittings.

When the installation of sealed service boxes as just described was found to be so effective, the next step was to provide suitable protection for the meter and its accessory wiring.

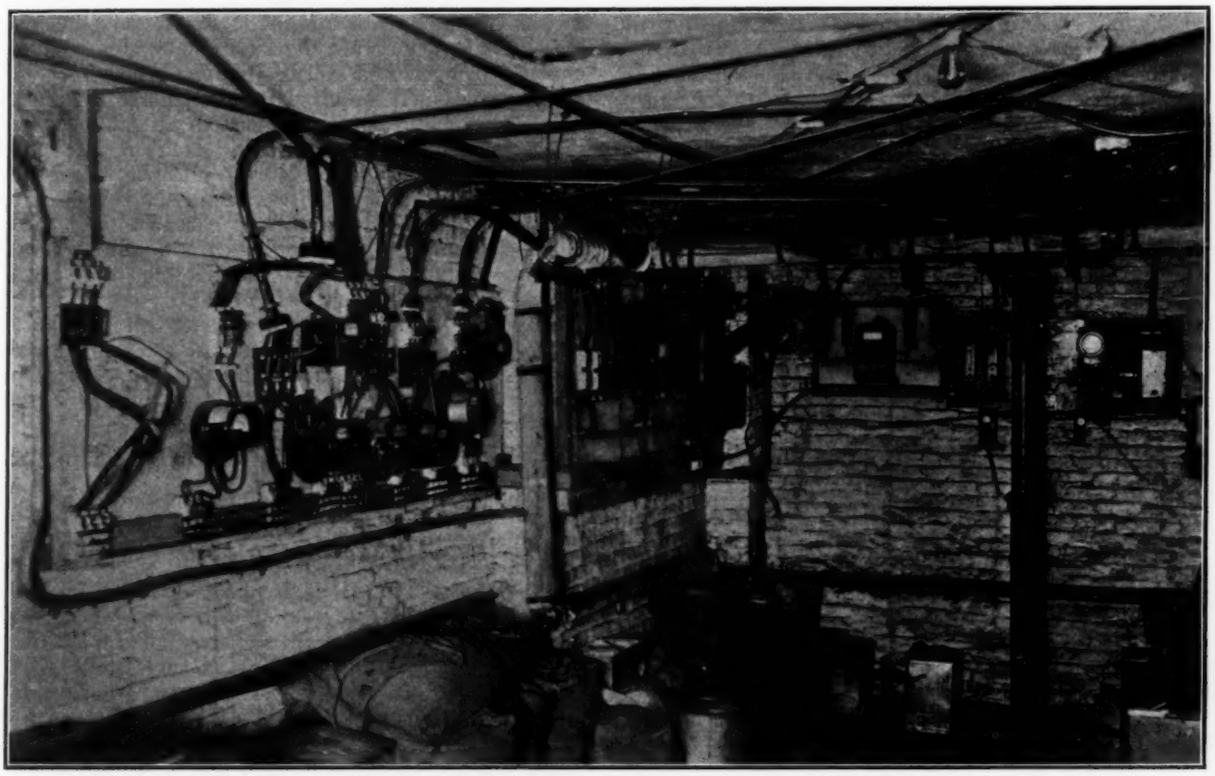


Fig. 7.—Typical Old-Style Meter Installation. Compare With Fig. 1, Which Shows Same Installation After Remodeling Along Modern Lines.

Full Service and Meter Protection.

So many plans for full meter and service protection have been developed within the past few years that now nearly all of the larger operating companies are making their service installations with a fully protected equipment.

It is the practice with some companies to provide full meter and service protection when the change is made from overhead to underground distribution.

As most underground districts have previously been supplied by overhead services the entrance to which was above the first floor, considerable expense is incurred in changing meters from the upper floors to the basement. This change involves the installation of a new meter board with the necessary wiring to connect it to the original distributing centers. When making such changes, particularly in large buildings where several large meters are installed, it is advisable to bring all meters to a point near the service entrance.

Prior to the starting of actual work a service inspector should make a careful field survey of the physical conditions outside and inside the building to determine the most advantageous point for the service entrance.

In selecting a location for the meter board, due consideration should be given to the matter of locating the equipment in a place which is least likely to be obstructed by the accumulation of material usually found in cellars. Sufficient wall space should be allowed for the service box and meter board, which should be so located as to be easily accessible to the company's employees at all times.

In order to make an iron-clad service installation it is desirable to incase the service wires from the pipe entrance to the service box in flexible steel conduit.

When companies are using a three-wire-bank form of distribution it is necessary to balance the load on each service as far as possible, since many of the services are apt to be two-wire. In office or similar buildings the installation may be balanced by using all two-wire meters, connecting these in a staggered position on a three-wire service.

In Fig. 7 is shown an old type installation and attention is called to the dangerous condition of wires as regards the liability of both fire and theft of current. A striking contrast is to be noted by comparing this view with Fig. 1. Not only is the new installation much neater, but by protecting all electrical parts there is eliminated possible injury to persons usually attendant on other methods.

Automatic Combustion Control Saves Much Coal

Eliminating the Personal Element and Substituting Automatic for Hand Control of Draft Saves 39 Per Cent of Coal Bill in One Hand-Fired Plant

By I. L. KENTISH-RANKIN

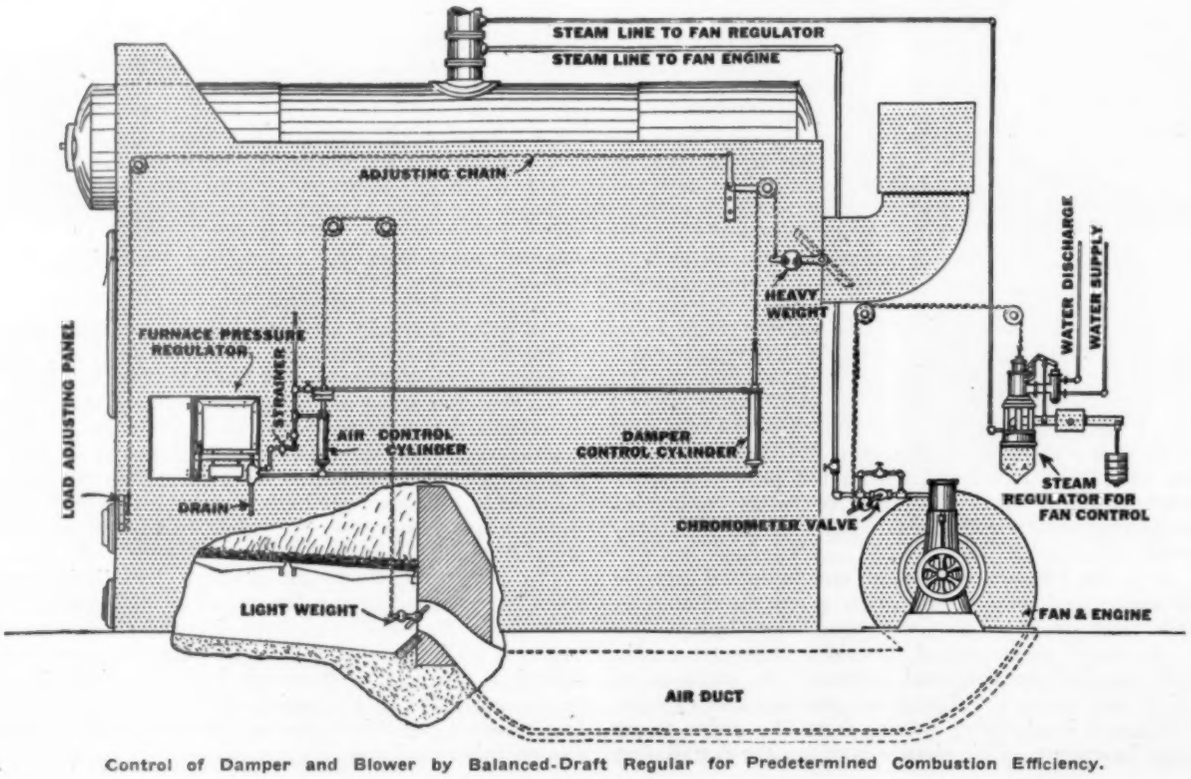
IN the ELECTRICAL REVIEW of December 8, 1917, pages 971 and 972, a review of the reasons for the increasing use of automatic draft control in place of hand control was given. It was emphasized in this preliminary article that the high cost of coal and the need for using it more efficiently were causing boiler rooms to awaken to the extravagance of allowing the combustion of coal to be placed in the hands of men unfitted to accomplish it properly. It will now be shown what the installation of automatic draft control accomplished in a typical isolated plant.

CHANGING HAND-FIRED BOILERS FROM MANUAL TO AUTOMATIC DRAFT CONTROL.

An isolated plant contained an aggregate boiler capacity of 1210 horsepower, composed of two 480-horsepower Heine and one 250-horsepower Jumbo boiler. All were hand-fired and used natural draft. In the endeavor to obtain higher fuel economy it was decided to install the balanced-draft system of draft control in place of hand control by the firemen, and then later to change from hand-fired to mechanical stoked grates if possible economies warranted. The aim sought was lower operating expenses, of which the coal bill represented the largest item. Balanced-draft control was claimed to offer a convenient method of improving matters and had the advantage that all equipment involved in the change was available for immediate installation, an important matter these days of protracted delays. It was therefore decided to adopt balanced draft immediately, but to suspend action upon mechanical stokers to a later date until the results obtained with automatic draft control should indicate whether or not the additional expense of mechanical firing would still be justified.

The equipment required for the change from manual to automatic control consisted of one balanced-draft gas-pressure regulator for each of the three boilers, one engine-driven blower, and one steam-pressure regulator. The gas-pressure regulator is operated by the pressure of the furnace gases in the furnace chamber and in turn operates the flue damper in the uptake and the damper in the air intake. When a change of pressure occurs in the furnace the regulator moves in such direction as to make the flue damper tend to oppose the change in the furnace gas pressure, and thus the two devices endeavor to maintain uniform pressure in the furnace chamber, as exemplified by the percentage of carbon dioxide, for all rates of combustion and condition of the fuel bed.

The blower set, which in the present instance is



Control of Damper and Blower by Balanced-Draft Regular for Predetermined Combustion Efficiency.

driven by a 7-horsepower engine, is controlled by the steam-pressure regulator. This blower is able to supply a constant volume of air to the furnace at variable pressure for definite blower speed, thus enabling varying thicknesses of fuel bed to exist without causing an excess or deficiency of air to occur. This means that high combustion efficiencies can be obtained for all conditions and thickness of the fuel bed, as indicated by the high CO_2, and all rates of firing. It also means that excess suction of the chimney beyond that necessary to remove the gases of combustion from the furnace is not required and is eliminated, hence the stack and atmospheric conditions play no part in modifying the air passed to the fire. The air supply is thus controlled by the furnace gases, for the highest CO_2 content in these gases, which means highest combustion efficiency, without interference or influence of extraneous factors.

A better idea of the equipment employed to change over from hand to automatic operation can be had from the accompanying illustration. It will be seen that the gas-pressure regulator, one for each furnace, is installed on the side of the furnace wall, and controls the air and flue dampers by means of flexible connections. The gas-pressure regulators must be installed at the furnace, but the other apparatus can be installed where most convenient as to space restrictions, depending upon the method of ash disposal, arrangement of ash pit and similar details of station design. No difficulty was encountered in installing the apparatus in a rather cramped boiler room because the equipment is compact.

What Balanced-Draft Control Accomplished.

The economies brought about by the installation of automatic draft control can best be appreciated by referring to the test data obtained immediately before abandoning hand control and shortly after the substitution of automatic draft control. The conditions were practically identical in the two runs, except that the run with the draft under the firemens' supervision was made after scrupulously cleaning all boiler heating surfaces and with the firemen taking especial care because they knew the eyes of the management were upon them, whereas after the installation of automatic control conditions were really more representative of every-day working conditions as they would be thereafter. It is probable that there is an actual saving in excess of that indicated by the test.

The accompanying log of furnace and boiler performance deserves careful and deliberate analysis, because of what has been accomplished and what may still perhaps be improved. In view of the existing coal shortage and exorbitant prices some of the results are almost startling. They are as follows:

First, although automatic draft control employs a cheaper grade of coal, namely a mixture of 50 per cent Youghiogheny screenings and 50 per cent anthracite dust, costing 75 cents, or 30 per cent, less per ton than the coal used with the draft under the firemen's control, the water evaporation was increased and the saving in cost amounted to 39 per cent. It is the actual financial saving with which the management is interested, in this instance a very substantial one.

Second, it will be seen that the carbon dioxide (CO_2), which is the index of combustion efficiencies usually taken, shows an increase from 6.7 to 12.4 per cent, which emphasizes better than anything else could the rapidity with which the maintenance of balanced draft answers to the demands made by the fuel bed for air, according to its thickness and condition, and at all times. This high percentage of carbon dioxide shows that the combustion efficiency is high, and it also shows very forcibly that by the maintenance of balanced draft between the inside and outside of the furnace chamber the inrush of cold air that otherwise invariably occurs when the firedoors are thrown open to rake over the fire or feed in coal is entirely absent.

Third, balanced draft, possible only by the fact that the automatically controlled blower supplies the requisite amount of air required by the fire at a variable pressure, if necessary, and as is necessary when the firedoors are opened, not only enables high combustion efficiencies to be obtained but also prevents the injurious contraction of the furnace and boiler parts that otherwise would occur with the inrush of cold air.

Fourth, it will also be noticed that the climatic conditions on the day the test was made with automatic draft control were such as would have interfered with natural draft, a factor that does not enter with automatically controlled mechanical draft, thus making boiler capacity independent of atmospheric conditions, or without sacrificing combustion efficiencies to obtain the draft.

Fifth, there is another condition directly chargeable to the use of balanced draft; it is that the velocity of the furnace gases through the boiler heating surfaces is lower than ordinarily is the case, since the blower supplies the draft or air required by the fuel and the stack acts only to carry off the gases of combustion instead of being required to furnish the draft. Consequently the furnace gases have given up more heat to the boiler contents than is the case with hand control. Note the flue-gas temperatures of 546 and 585 degrees Fahrenheit, respectively, for balanced draft and manual control. The flue-gas temperatures and the percentages of carbon dioxide when considered together prove that not only had the maintenance of balanced-draft conditions enabled higher combustion efficiency but also higher boiler efficiency since more heat has been abstracted from the furnace gases. Notice also the feed-water temperatures in each case.

Another thing arouses interest, namely the higher carbon content in the ash where automatic control was employed, being 3.18 with automatic and 2.22 per cent with manual control. This was not so much due to imperfect combustion as at first might be supposed as to the fact that the furnace grate was not originally designed for burning coal dust, hence some of the carbon dust fell through the grate into the ash pit unburned. However, the use of dust has 75 cents per ton in its favor in this instance, and although a different grate would have saved a small portion of the carbon the loss did not warrant the expense of changing the grates.

Why Balanced-Draft Control Is so Effective.

The writer has endeavored to point out how the replacement of erratic hand control of the air supplied to the fuel bed by mechanically and accurately controlled automatic apparatus has increased the heat value of the fuel and the efficiency of the boiler, thereby saving 39 per cent of the fuel bill. These facts are borne out by the accompanying test data. But since summer, when the change from hand to automatic control was made, it has been found that the maintenance of balanced draft in the furnace chamber has practically eliminated cracks in the boiler settings and thus air infiltration does not occur, nor would it matter if it did. The firedoors may be opened without fear, since the pressures inside and outside the furnace chamber are practically the same. The firemen are

therefore able to devote more care to their fires, without lowering the internal temperatures due to excess air, in fact this is all they have to do since the air supply takes care of itself.

More careful firing—not combustion, because that is taken care of automatically—which means raking over the fire to cover the thin spots and thin out the thick so that the fire is of uniform thickness makes a better combustion, less smoke and increases the life of the grates. The best way to eliminate smoke is to fire little amounts of coal often and this can now be done since the firemen can watch their fires without worrying about their air supply, which being correct for all rates of firing tends to eliminate smoke in any case. Automatic draft control has in this case saved coal and given higher over-all economy. Less coal burnt means less ashes to dispose of. Less work for the men means they can do better what remains to be done. Moreover, the more uniform temperatures within the furnace and boiler have resulted in lower maintenance charges. Were the plant somewhat larger a saving in labor would also have accrued.

Automatic versus manual control of the air supply to the fuel bed, which is the one all-important factor in combustion, is a question that must force itself to the fore with increasing force as engineers and business men realize the conditions being created by the labor and fuel situations. It is not a matter of choice but of necessity. The fuel situation is acute. Especially now to use every bit of coal to best advantage is of vital importance to national as well as personal interests. It is not all plants that can afford technically trained men to run their plants, unfortunately only few would use them if they could. The use of automatic combustion control is, however, the next best thing for those thousands of small plants that are now adding their quota in wasting the 150,000,000 tons of coal annually in this country that might be saved in large measure by more efficient use. Automatic combustion control removes the control of combustion from the erratic personal element, that changes from hour to hour, that is susceptible to fatigue, to mental and other influences, and instead accomplishes it scientifically, efficiently and accurately at all times.

LOG OF FURNACE AND BOILER PERFORMANCE.

	Natural draft		Balanced draft	
Date of test	June 29		July 29	
Weather	Foggy		Clear	
Relative humidity, per cent	100		58	
Average temperature, deg. Fahr.	49		92	
Type of boilers	Two 480 h.-p. Heine and one 250 h.-p. Jumbo			
Total boiler capacity, h.-p.	1210		1210	
Kind of coal used	Youghiogheny screenings		Yough'y scngs. 50% Anthracite dust 50%	
Average steam pressure, lbs. per sq. in.	134.4		134.7	
Average feed-water temperature	143		135.8	
Average flue-gas temperature	585		546.0	
Factor of evaporation	1.1154		1.1229	
Total weight of water measured, lbs.	287,406		265,968	
Total weight of water evaporated (corrected for temperature)	287,265		266,359	
Total weight of water evaporated from and at 212° F.	320,415		299,095	
Total weight of coal fired, lbs.	41,006		33,200	
Total weight of dry coal fired	38,570		31,763	
Total weight of dry ash and refuse.	4,752		4,172	
Percentage dry ash and refuse (from dry coal)	12.3		13.1	
Pounds water evaporated, per pound of coal—apparent	7.01		8.02	
Same—From and at 212° F., as fired	7.81		9.01	
Same—From and at 212° F., dry	8.31		9.41	
Same—From and at 212° F., combustible burned	9.48		10.84	
Efficiency, boiler, furnace and grate, per cent	59.4		68.7	
Efficiency, boiler and furnace, per cent	60.9		70.5	
Boiler horsepower per hour	929		825	
Percentage rated capacity	76.8		68.2	
Flue-gas analysis—percentage CO_2—				
Boiler No. 1	6.9		11.9	
Boiler No. 2	7.1		11.3	
Boiler No. 3	6.0		13.9	
Average	6.7		12.4	
Analysis of coal—				
Moisture, per cent	5.94	dry	4.33	dry
Volatile	30.95	32.90	18.93	19.73
Fixed carbon	53.61	57.00	66.37	69.43
Ash	9.50	10.10	10.37	10.84
Total	100.00	100.00	100.00	100.00
Sulphur	1.25	1.31	1.13	1.18
B. T. U., per lb., as fired	12,769		12,725	
B. T. U., per lb., dry		13,575		13,300
B. T. U., per lb., combustible		15,100		14,914
Analysis of ash, dry—				
Combustible, per cent	17.78		24.19	
Earthy matter	82.22		75.81	
Total	100.00		100.00	
Percentage dry fuel lost as combustible in ash pit	2.22		3.18	
Cost per 1000 lbs. water evaporated, based on coal as fired, Youghlogheny @ $2.50 and anthracite dust @ $1.00 per ton, cents	16.00		9.76	
Percentage saving with balanced draft	.....		39.0	
Same—Based on dry coal, cents	15.05		9.36	
Percentage saving	.....		37.8	

Proposed Additional Power Development for Seattle.

Seattle seems assured of being granted the right to develop the Diablo Canyon power project on the Skagit river in the Washington National Forest. The right, it is assumed, will be granted under certain conditions which seem to mean the ability of the city to carry through the proposed development.

The granting of development rights to the city is taken to mean that a permit held by the Skagit Power Company, a Stone & Webster corporation, since 1912 has been canceled in favor of the municipality.

Anticipating favorable action on the part of the Department of Agriculture, the City Council has passed an ordinance authorizing the issuance of $5,000,000 of light-fund utility bonds and directing the Board of Public Works to call for bids for a completed power project on the government reserve.

Several years ago a permit for the development of the Diablo Canyon project was granted to E. M. Riggs, of Colorado Springs. In 1912 it was transferred to the Skagit Power Company, controlled by Stone & Webster, and until this year the company paid annual fees on the permit. This year it asked to be relieved from such payment because of unsettled conditions resulting from war and the inadvisability of proceeding with so large a development at this time. Whether such relief was granted or not officials of the corporation had not been advised, but at about the time this relief was asked of the department at Washington, the city of Seattle filed a claim over that held by the Skagit Power Company and the answer to that petition came in the telegram received by the city's corporation counsel recently and which is believed by him to indicate success for the application of the city.

The bill passed by the council, authorizing the issuance of $5,000,000 of bonds to cover the cost of a completed hydroelectric project, also directs that bids on such a project on a government reserve be called for by the Board of Public Works, the city pledging itself to acquire all needed government rights.

As previously announced, the board is authorized to call for bids on a completed project, the water supply to be sufficient in amount to insure the generation and delivery at first of approximately 13,000 kilowatts continuously, or sufficient to secure the generation and delivery of 25,000 kilowatts for a period of five hours each day, and approximately 10,000 kilowatts for a period of nineteen hours each day, the power to be measured on the low-tension side of step-down transformers at a substation to be situated within the city of Seattle.

Editorial Comment

The Problem of Utility Financing

THERE is no doubt that despite the coal and labor shortage, the high prices for material and the many other unusual conditions which have been imposed upon the central-station industry, utility companies showed an appreciable gain in net revenue during the past year. In the review of central-station conditions presented by T. C. Martin in our last issue it was pointed out that the gross earnings from the sales of energy and service during 1917 reached the enormous total of $500,000,000. The gross total income reached $175,642,338 in 1907 and $302,115,590 in 1912, hence nearly doubling in the five-year period, at which rate it might easily be in excess of half a billion for 1917.

Such figures are eloquent as to the general demand for electric light and power in one or another of their manifestations, and furthermore furnish impressive evidence of the cumulative value of electrical securities to the investing public. Nevertheless, one of the most serious problems of the central-station industry today is that of raising capital to finance much needed extensions and rehabilitation. Statistics, such as above, seem to have little weight in preventing a slump in market prices of electrical securities in common with other securities which in many cases have been adversely affected by the national situation. It seems to be another case of the innocent made to suffer with the guilty.

The seriousness of the situation should be taken to heart by every utility executive manager and financier. A campaign of education should be undertaken, collectively and individually and every effort made to have the real facts become known.

A statement sent to the ELECTRICAL REVIEW by Henry L. Doherty summarizes the present situation in an admirable manner and offers additional reasons why an educational propaganda should be undertaken at once. It is as follows:

"Investors have taken fright. Confronted daily with some new perplexity, they magnify details of warfare so greatly they cannot see the real achievements. Because some of our soldiers in some of the training camps have not quite enough shoes they fear we shall lose the war.

"Even for the selfish citizen, who insists upon looking at the present situation solely from the point of view of business, there is more reason for courage than for fear. The business of running this war is the biggest piece of business that America has ever undertaken. Every workshop and factory will have employment, and every worker can find occupation for whatever number of hours he is willing to work. Those into whose hands will fall the direction of this business already realize, or will see, that the economic life and welfare of the country are vitally important to the prosecution of the war.

"Government supervision of the railroads, government regulation of prices and use of many important commodities, war taxation—these and many other matters may temporarily disturb industry. These things are being done, however, so that our lives and our property may be safe against aggression.

"Let us all take courage and ask ourselves whether we individually are doing our own full part in helping solve the present problem, not only the problem of the nation, but the problem of civilization. We have the strength for the task. Let us cease finding fault, and let us stop carping at any man who is trying to do his share, while we carefully inquire into our own relationship to the situation. Where we criticise, let us do so constructively, and let us criticise ourselves personally. Is there anything else that you and I can do to help?"

Protecting Service Installations

ELECTRIC central-station service is less than 40 years old. Vast changes have taken place in that time in nearly all features connected with such service, especially those involved in the generation and distribution of the electrical energy, its measurement and the system of rates for charging for the service. In spite of all the advances made along these and related lines, one finds an astounding lack of progress in the average central-station system at the point of contact between the company's lines and the customer's circuits—the service connection.

In the early days the many difficulties met with at the power house caused the concentration of attention there. Later numerous storm damages and the requirements of municipalities brought about many improvements in the location and construction of the distribution lines. Aside from the installation of meters, after the early flat rates were abandoned, and their subsequent replacement by more modern meter types, there has been relatively little advance at the service end of the line until quite recent years and then only on the part of the most progressive companies.

A number of cities have made regulations regarding the running of the service drop, the location and nature of the service entrance to the building, and the location of the service switch. Moreover, the National Electrical Code covers a number of these points, but unfortunately is not lived up to universally throughout the country. The consequence is that service connections are in need of radical improvement in many

communities. Several features of this improvement are pointed out in an article by E. B. Meyer in this issue, which is the third article relating to overhead and underground services he has written for our readers in recent months. Especially important are his comments on the protection of the service installation.

There are four kinds of trouble to be guarded against at the service installation in the ordinary building. First, there is the fire hazard which requires proper wiring and location of a suitable switch and fuses readily accessible and close to the service entrance so that the service can be entirely cut off from the premises in case of fire. Then there is the life and accident hazard which calls for elimination of live parts exposed to possible contact by the owner or occupant of the premises. There is also the hazard of possible interruption of the service with attendant damages from short-circuits due to careless wiring or contact of an exposed switch or cutout with metallic objects that may be carried by or placed in the vicinity. Finally there is the hazard of loss to the company from theft of current by tampering with the service or meter wiring. Partial protection is obtained against each of these difficulties by careful and workmanlike wiring, neat arrangement of the wiring, and especially by thorough insulation of all conducting parts. Running all the wires in conduit, either rigid or flexible steel or non-metallic conduit, and putting the service switch in an iron box helps very materially in this connection. And yet these are but incomplete means of accomplishing the end desired, which should be complete protection by entirely inclosing and sealing the switch, meter and connecting wiring.

A striking comparison of the common slipshod method of service wiring with the full protection afforded by complete inclosure is shown by two illustrations in Mr. Meyer's article. The contrast is more effective in showing the great value of modern service and meter protection than any long dissertation on the subject. The cost of the necessary inclosures as developed by several manufacturers is quite moderate in comparison with the losses possibly incurred by failure to provide full protection, so all central-station companies should give the matter most careful consideration. It should be noted that not only is complete protection afforded in this manner from the four hazards above cited, but the installation is neater, the meter is more easily tested and repaired, and it is possible to disconnect and lock the service without the expense of removing the meter.

Smoke and Conservation

OUT of an almost universal coal shortage one factor of the fuel situation stands alone in its abundance. That factor is smoke. Whereas coal is scarce, wherever coal is found smoke is abundant. And it is extremely objectionable in its abundancy.

At the present time coals are being burnt under boiler settings and furnace chambers unsuited to them, and by men unfamiliar with the best ways of managing their fires, and thus the smoke nuisance is increased in magnitude. Smoke is objectionable because it means that heat is being wasted. But it is more objectionable for its deleterious influence upon health, and the expense and annoyance of ruined vegetation and dirtied materials. The subject of smoke is therefore one intimately allied with that of conservation.

Smoke may be due to insufficient air, insufficient furnace space, insufficient furnace temperature and insufficient intermixing of air and combustible gases. Narrowed down, smoke may be due to improper firing or improper equipment. Too often it is due to both, and thus while theoretically smoke is preventable, as a normal by-product of normal operation it devolves in practice to reducing it to a minimum. It is not the sporadic gust of smoke that wastes coal and ruins or damages everything within its range, but the continual clouds and streams of dirt and soot and smut that cover streets, linens and structures, pollute the atmosphere, endanger health and kill vegetation, to a national loss of many millions yearly.

While smoke and efficient boiler-room performance cannot go together, a smokeless stack is not necessarily indicative of efficient combustion. Too often is it suggestive of wasted heat due to excess air, often believed the cheapest and frequently the quickest and simplest way to live up to civic smoke ordinances without changing furnace chambers and operating methods. Thus is obtained partial smoke reduction, inefficiently and unscientifically, whereas smoke abatement and conservation should go together. Prevention is better than cure. Prevent smoke by burning the coal properly. Civic smoke inspectors and bureaus should tackle the smoke problem with the attitude of preventing rather than curing, conserving coal rather than punishing offenders. It is more effective; it is cheaper; and is the only efficient way of abating smoke.

We all look to the day of universal electric heating, when coal does not come to the city, but only its energy in the form of electricity. But that time is not yet. We even look to the time, perhaps closer than many think, when gas is used for heat and coal for the thousand and more products that with the limited knowledge of today it represents. But the time for even this is not yet here. The time is now, however, when the centralized heating plant should come into its own of efficient, economical and smokeless utilization of coal for heat and electricity. For the present this is the simplest solution toward the mitigation of the smoke nuisance in many of our cities and congested districts; and also a radical and effective move toward the conservation of coal.

There was a time when a smoking stack was a source of pride, indicative of industry and commercial activity. But times are changing. Today smoke is no longer a cause of pride, but of regret. It is no longer a credit to industry but a reflection on an unpatriotic and unbusinesslike act.

Week's Events

Program for Ohio New-Business Convention—Review of Telephone Development During War Period—Other News

PROGRAM FOR OHIO NEW-BUSINESS MEETING.

Industrial Power Subjects to Be Discussed—President Lieb to Attend Banquet in Evening.

The meeting of the new-business committee of the Ohio Electric Light Association which is to be held at the Miami Hotel, Dayton, O., on January 16, is to be under the industrial power and heating section of the Association. A banquet is to be held in the evening under the auspices of the Electric Club of Dayton and President Lieb of the National Electric Association will be the principal speaker.

The program for the new-business meeting is as follows:

Address of welcome by Judge E. P. Matthews, vice-president, the Dayton Power & Light Company; paper, "Low-Temperature Industrial Heating," by Dwight D. Miller, Society for Electrical Development, New York City; discussion by H. J. Kuhns, heating engineer, Toledo Railways & Light Company, Toledo, Ohio, C. W. Bartlett, General Electric Company, Schenectady, N. Y., and Wirtt S. Scott, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

At 12:15 there will be a luncheon in the Breakfast Room of the Miami Hotel, at which there will be an address by George C. Smith, chief of industrial surveys, Baltimore & Ohio Railroad, on "Industrial Surveys for Intensified Service."

At the afternoon session there will be a paper entitled "The Uses of Electricity for the Manufacture of Chemicals" by C. A. Winder, General Electric Company, Niagara Falls, N. Y. Discussion will be by C. D. Carlson, Cleveland Electric Illuminating Company, Cleveland, O., and J. C. Matthieu, Dayton Power & Light Company, Dayton, O.

There will also be a paper entitled, "Water Pumping by Electricity," by R. L. Yates, assistant manager, Platt Iron Works Company, Dayton, O., discussed by C. I. Crippen, Mahoning & Shenango Railway & Light Company, Youngstown, O., and F. H. Hooper, Northwestern Electric Light & Power Company, Van Wert, Ohio.

PROGRAM FOR BANQUET.

Frank B. Steele will be chairman and Roland W. Baggott, Judge of the Court of Domestic Relations, Dayton, will be toastmaster.

The speakers will be J. W. Lieb, president, National Electric Light Association, "The Electrical Industry and the War;" Hon. J. M. Switzer, Mayor, City of Dayton, "The City and the Public Utilities;" D. L. Gaskill, secretary, Ohio Electric Light Association; C. F. Kettering, president, Dayton Engineering Laboratories Company; E. R. Kelsey, governor, International Association of Rotary Clubs; Lee Warren James, president, Greater Dayton Association, "The Commercial Organizations and the Public Utilities;" R. H. Grant, general manager, Domestic Engineering Company, Dayton, O., "Salesmanship."

SPECIAL TELEPHONE SERVICE EXTENDED TO THE GOVERNMENT.

Calls for Preference Met Promptly by Bell System. National Capital Well Provided for—Review of Year's Activity.

Throughout the Bell telephone system all Government toll calls are given precedence over commercial business. To give this special service to the Government has required the development of special operating methods and the drilling of some 12,000 long-distance operators.

A large amount of wire, now some 12,000 miles, has been taken from commercial use and turned over to the Government for special wire service. In many cases, immediate replacement has been necessary so that there might be no reaction on Government calls handled on commercial circuits. Some 25,000 miles of telegraph facilities have also been provided by the Bell system.

The National Capital now has twice as many long-distance toll lines as before the war, and when all the additions now under way are completed, will have 500 long-distance wires radiating to every part of the country with proportionate increases in toll switchboards and operating forces. Some indication of the requirements of the National Capital for telephone facilities is shown by the fact that on all the main wire routes centering in Washington, the growth in telephone traffic during the last few months has been greater than the entire growth during the preceding eight years.

Work on a new underground cable from Washington to New York is now well under way. This cable will contain 80,000 miles of wire and will be a valuable addition to the existing underground system which provides the National Capital with all-underground communication with Baltimore, Wilmington, Philadelphia, Trenton, Newark, New York, Bridgeport, New Haven, Providence and Boston—all centers of extraordinary activity in the manufacture of munitions and war materials.

The installation of the fourth addition which has been made since February to the toll switchboard at Washington is now practically completed, which will increase the capacity of the board to 270 per cent of what it was at the first of the year.

Extensive additions to local switchboard equipments at Washington have been completed, and on September 1 a new central office known as "Franklin" was opened. This new central office equipment with its corresponding increase in operating force will be capable of handling 30,000 calls per day. In anticipation of further increase in traffic a large addition to this office is now being made which will increase its capacity nearly threefold.

A very large increase has been made in the station and trunk-line equipment of all the private-branch exchanges of the federal departments in Washington in anticipation of the continually increasing requirements

of these departments. New or enlarged switchboards have been provided and in several cases, large multiple switchboards have been installed of sufficient size to care for the service of a town or small city.

A very large amount of underground cable work has been done, and large additions to the cable plant have also been made in connection with the expansion of the various federal departments.

Extension of Long-Distance Equipment.

An enormous increase in long-distance facilities has been provided throughout the country, that satisfactory service may be maintained between cantonments, training camps, guard outposts, military supply stations, war industries, the National and State Capitals and other centers of Government activity.

At many important points in different parts of the country, additions to the local and toll switchboard facilities have been or are being made to care for expected increases in war traffic due to the proximity of navy yards or training camps, etc.

The existing telephone plants at all the army posts, navy yards, department headquarters, etc., have been greatly increased, switchboard positions added, cable plant increased and station equipment augmented.

Cantonment Service.

The opening up of sixteen National Army cantonments meant practically the establishment of 16 new cities of from 30,000 to 40,000 inhabitants each, for which it has been necessary to provide adequate telephone equipment, both local and toll. Providing the material and the organization of forces for performing this work within limited time was a great achievement.

In each cantonment a complete common-battery system consisting of from six to ten positions has been installed and a modern cable-distributing plant serving from 300 to 500 stations. Long lengths of open wire and cable containing from 50 to 100 pairs of wires, have been provided to insure adequate trunking and toll facilities to nearby cities. In some instances where cantonments are located in sparsely settled territory, complete toll switchboard equipment has been installed at the cantonment consisting of from 4 to 12 positions. The work of manufacturing and installing complete central-office equipment such as those provided for the cantonments, ordinarily requiring under normal conditions from nine to ten months, has been engineered, manufactured and installed in less than four months.

At each of the 15 National Guard camps a complete telephone system has also been required. From four to six positions of switchboards have been installed and a complete cable distributing plant has been provided within the camp. As in the case of the National Army cantonments provision of adequate trunking facilities to nearby cities has been necessary and an enlargement of local and toll switchboards at many of these points has also been required.

In connection with the construction work at the National Army and the National Guard camps, it was necessary to furnish temporary telephone facilities for the use of contractors and construction quartermasters, necessitating the installation, on very short notice, of telephone equipment and trunk lines to the nearby towns.

Much work has been done in providing adequate telephone facilities at many of the smaller training camps, such as Naval, Officers' Reserve, Embarkation, Aviation, etc.

Other Government Service.

A large amount of telephone equipment has been supplied to facilitate communication between the proper headquarters and important railroad points, bridges and water supply systems, which have been protected by detachments of the National Guard and at present by private guards.

The exigencies of war have required a reorganization and enlargement of the United States Coast Guard telephone system and in this work the American Telephone & Telegraph Company and associated companies have been giving very great assistance. Telephone connections are being provided for approximately 100 lighthouses and 200 coast-guard stations, necessitating the laying of about 300 miles of submarine cable, the construction of 650 miles of pole line and the stringing of over 1200 miles of wire.

By arrangement with the Signal Corps, United States Army, 14 battalions of the Signal Corps, United States Reserves, have been organized by the Bell system and certain specially trained men have also been detached from company service to the naval coast defense and to the navy. More than 150 have been admitted to the officers' training camps.

About 2,500 men have thus been enrolled. Besides this, a large number of Bell employes were members of the National Guard and the Naval Militia or are otherwise under oath to present themselves when called, making a total of over 7000 Bell employes who are now or will be in the near future, in the service—or more than 18 per cent of the male employes of the system between twenty-one and thirty years.

Important research and development work for the Army and Navy which is of so confidential a nature that it can not be made public, is occupying much of the time and energy of the scientific staffs and laboratory forces of the Bell system.

War Lecture Before Lynn Section, A. I. E. E.—On January 2 Lieut F. O. Crosby, of the British Royal Flying Corps, gave a lecture of unusual interest before the Lynn (Mass.) Section of A. I. E. E. The great progress in construction during the last three years was clearly shown. The speaker is a man of practical experience and at the outbreak of the war enlisted in airplane service and crossed the English Channel over 150 times, the trip being made in from 15 to 28 minutes. After a time his work was over the German lines, but he was finally shot down at an altitude of 1300 feet, and although seriously injured at length recovered. The lieutenant said that a speed of 152 miles an hour is made by the latest type of scouting planes, and gave it as his opinion that before long trips to Berlin and return would be made from the allies' lines. The new Henly-Page machine will carry a couple of dozen men, a ton or more of explosives, and two guns. The attendance at the lecture was about 400.

Sugar Shortage Affects Lamp Manufacture.

According to dispatches, officials of the Westinghouse Lamp Company of Bloomfield, N. J., have appealed to Federal food authorities for 35 pounds weekly of brown sugar, stating it would be necessary to suspend operations in the company's plant unless the request was granted. It was explained that brown sugar is used in infinitesimal amounts in the manufacture of electric globes. Federal Food Administrator Fielder of Jersey City gave assurances that the amount desired would be made available each week.

NEWS NOTES

Another Utility Seeks Rate Increase in Illinois.—The Central Illinois Public Service Company has filed a petition with the Illinois Public Utilities Commission to advance the rates for electric service in Toulon, Ill. The Illinois Public Utilities Commission has suspended the proposed power rate applying to Charleston, Pana and Taylorville until March 19, 1918.

Naval Training Station Wants Catalogs and Descriptive Literature.—United States Navy Supply Department, 1218 Edison Building, Chicago, which is sending out proposals for supplies for the U. S. Naval Training Station at Great Lakes, Ill., would like to receive catalogs and other descriptive literature from manufacturers and jobbers, to be used for its purchasing files.

Addition to Niagara Falls Power.—The Hydro-Electric Power Commission of Ontario is building a new pipe line from the intake to its generating station at Niagara Falls, which station was recently taken over from the Ontario Power Company. The additional pipe line, together with extra water wheel and generator equipment, is expected to be completed by next July. About 25,000 additional horsepower will be developed in this way.

Iron and Steel Electrical Engineers Meet.—The Philadelphia Section of the Association of Iron and Steel Electrical Engineers held a meeting in the Majestic Hotel, on the evening of January 5. The speakers were John C. Reed and Merwyn J. Hocker, electrical engineers of the Bethlehem Steel Company, Steelton, Pa., having as their subject "Electrically Operated Bridges," which was illustrated with lantern slides. The meeting was preceded by an informal dinner at 6 p. m.

London Opens an American Chamber of Commerce.—An American Chamber of Commerce in London has been organized, with headquarters at 8 Waterloo Place, Pall Mall, S. W. The purpose of this Chamber of Commerce in London is to promote closer trade relations between Great Britain and the United States. A library has been opened at the headquarters, which is accessible to the members and to all those interested in the commerce and trade of the two countries, and as much available information as possible will be disseminated.

War Problems to Be Discussed at Engineers' Meetings.—American Association of Engineers has put in effect a plan of having one or more addresses at each meeting on engineering and industrial problems that relate to the demands and requirements of the nation in the existing war crisis. At the regular meeting of the Chicago Chapter, on the evening of January 4, an address on "Patriotism and Production" was delivered by John W. O'Leary, president of Chicago Association of Commerce. Samuel L. Greeley, consulting hydraulic and sanitary engineer, followed with an address on "Housing the National Army," in which he gave an outline of how sixteen new cantonments were constructed in 130 working days. T. B. Lambert, chief electrical engineer of Chicago Telephone Company, and inventor of a wireless device for transmitting 1000 words per minute, and other apparatuses, was elected president of the Chicago Chapter. Others were elected to office as follows: Paul Augustinus, chief engineer and vice president of Marquette Electric Company, first vice president; Ferdinand Oudin, chief engineer of Addressograph Company, second vice president; Robert W. Shelmire, designing engineer for Robins Conveying Belt Company, secretary; L. O. Wolf, assistant engineer Illinois Central Railway, treasurer.

Electrical Exhibit at Iowa State College.—Iowa State College, Ames, Ia., holds its Farm and Home short course during the week from January 28 to February 2. In this connection the Electrical Engineering Department has made plans for an exhibit of electrical appliances and farm lighting sets. The details of this are shown in a blue-print plan which has been sent out. The central idea is to help speed up farm production by the greater use of electricity for lighting and power on farm premises, thereby increasing efficiency. The equipment and methods required in farm utilities are to be demonstrated by electric power and lighting units in the exhibit room referred to. The power will be applied to household appliances and farm and dairy machines.

"Lightless" Nights in State of Washington.—In view of the present abundant fuel supply in Washington and the fact that the bulk of the electricity in the state is produced by water power, the state fuel administration has been granted discretion in the enforcement of the recent order of the national fuel administrator establishing "lightless" nights on Sunday and Thursday nights. It is practically certain, however, that the Washington mines will soon be called upon to supply all of Washington, northern Idaho, western Oregon and northern California. This economy will hit many power plants in the state, for although most of them use water power, many, including both those which furnish electricity in Seattle, are compelled to help out their water power with fuel.

Progress on New Plant for Utica Company.—In the equipment of the new hydroelectric power plant of Utica (N. Y.) Gas & Electric Company, the Platt Iron Works Company, Dayton, Ohio, is installing two of its 9000-horsepower water turbines, which are being direct-connected to Westinghouse generators. These turbines have 54-inch runners, and will operate at 288 revolutions per minute, under a head of 256 feet. They have 66-inch diameter valves, and are being equipped with Lombard governors of 45,000 foot-pound capacity. The water wheels are housed in cast-iron scroll casings, and are mounted on nickel-steel shafts. The Platt Iron Works Company, which long has specialized in steam and motor-operated pumps, air compressors and oil-well equipment, is now giving much attention to water-wheel manufacture.

Indiana Commission Reorganizes Duties of Members.—A reorganization of the duties of each member of the Indiana Public Service Commission has been announced. Hereafter Commissioners Charles A. Edwards and John A. McCardle will handle cases which pertain to railroads, both steam and electric, telegraph and express companies. Chairman E. I. Lewis, who has been handling railroad problems, will hereafter consider cases involving warehouses and heating plants. Commissioner Paul P. Haynes, the newest member of the board, will consider cases involving telephone and gas companies. Commissioner Edwin Corr will handle plants relating to electric light and water cases. After each commissioner has handled a case to the point where a decision is to be made, the full commission will discuss the matter and instruct some member to write the order.

Commercial

Appliance Policy for 1918—Central-Station Power for Fire Pumps—Central-Station Activity at Piqua—Other News

THE APPLIANCE POLICY FOR 1918.

Central Stations Will Find Domestic Appliances Greatest Field for Additional Business.

By R. A. Mac Gregor.

In regard to central stations failing to push appliances during 1918, as referred to in the Electrical Review of December 22, I am frank to say that if they don't do this I am at a loss to see what they are going to do and am led to believe that such stations prefer to lay dormant during the coming year.

I cannot help but feel that this would be the biggest mistake that any central station could make, for there is no business or no individual who can stand still. He must either forge ahead or go back and I believe that central-station men as a whole are live enough to realize this and will keep busy doing something.

The condition of the business is such that we must conserve our station capacity as it is hard to get new equipment. It is also hard to get money interested at this time so we must make the best of what we have.

Again extensions to distribution systems cannot be carried on as of old on account of cost of such construction, but all this does not mean we have got to be idle by any means.

Electric ranges are mentioned in the same line with appliances. Now I look at these from two different angles, because with the range at this time (due to the fact that their use is not general), it seems advisable to make separate installations for each range and keep them off the secondary banks now installed. This calls for a transformer and with us, often the extension of the primary, which makes the installation cost prohibitive at this time, so we are not expecting to be active on range sales during the coming year.

However, on the balance of the line of appliances the Merchants Heat & Light Company (Indianapolis) has been pushing these strong since May of last year when we realized what conditions were going to be.

Of course we do a good store business all the time, owing to our location, but we have been pushing the field men on appliance sales more than ever since last May and will continue to do so during the coming year.

Our appliance sales business this year shows an increase of 54 per cent over last year and last year our store sales were influenced tremendously by our opening this new office on "The Daylight Corner."

Again sales organizations are not made in a day—in fact it takes years, and to me it looks like a very poor policy to cast to the winds the results of hard work of years when a change of policy will keep an organization intact and if this work is persisted in, eventually it will make the organization a revenue-producing one on a self-supporting plane.

In order to do this, however, all goods should be sold at list and terms in line with goods merchandising should prevail.

I am in full accord with the efforts now being made by the National Contractors' Association to stimulate this branch of the business for I believe when the contractors wake up and change their back-alley, congested, dirty offices into clean, neat electric merchandise salesrooms, on travelled streets, the whole business will be improved for all.

I am not in sympathy with the stations who do not handle appliances, leaving it to local stores and contractors to handle these goods.

It takes the central station in every town to set the pace and this pace should be a good swift one, always carried on in a way that will not injure the business of the local appliance dealers.

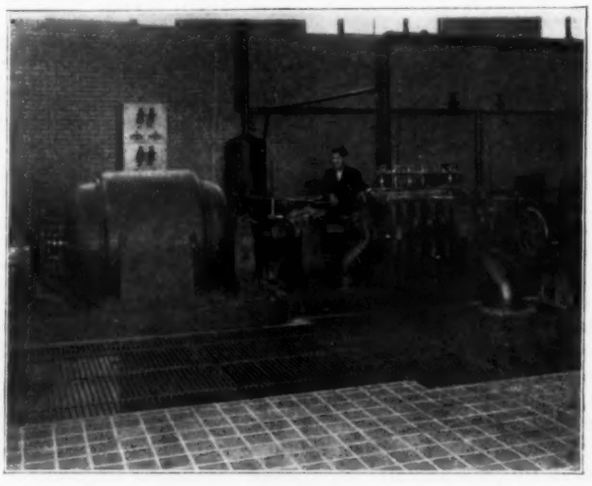
In closing I cannot help but feel that it would be the worst possible calamity to the business which could happen for stations to lay down at this time.

CENTRAL-STATION SERVICE OPERATES TOLEDO FIRE PUMPS.

Noteworthy Installation a Testimonial to the Reliability of Purchased Power.

The use of central-station service in the new fire-pumping station at Toledo, Ohio, is a significant testimonial to the reliability of purchased power, particularly when it is realized that no auxiliary power supply was thought necessary.

The initial installation includes four motor-driven five-stage centrifugal pumps, each capable of delivering 2000 gallons per minute against a pressure of 300 pounds per square inch at a speed of approximately 1500 revolutions per minute. There have been provided blank spaces for two additional pumps. The water supply comes direct from the river and the distribution system is entirely separate and distinct from that which carries the filtered water.



Fire Pump at Toledo Driven by 550-Horsepower Motor.

The electric motors for driving the pumps are of

the alternating-current, slip-ring induction type. The motors are supplied with three-phase current at 25 cycles and 4000 volts for the operation of these pumps. The normal rating of each motor is 550 horsepower, and the energy is furnished by the Toledo Railways & Light Company for both alternating and direct-current circuits, though an emergency direct-current motor generator set has been installed.

There is a 12-panel switchboard of blue Vermont marble provided and the oil switches for the control of the high-tension current have been placed in the pipe gallery. The basement drainage is taken care of by means of a vertical sump pump and motor, while for emergency use the larger pumps can take suction direct from the sump.

The total pumping capacity of the station is 8000 gallons per minute aside from the two future pump units, foundations and piping for which are now ready. This is sufficient to care for a much larger central territory than the 200 acres protected by the existing system of high-pressure mains, and therefore the city will soon undertake the construction of additional mains designed primarily to reinforce the existing system and so located as to provide for territory not now protected by high pressure.

CENTRAL-STATION BUSINESS AT PIQUA HAS MADE RAPID PROGRESS.

Power Load Aggregates 2500 Horsepower—Energy Obtained from Dayton Power & Light Company.

Piqua, Ohio, is an industrial center in which central-station power used is represented by a connected motor load of 2500 horsepower, the consumption of energy reaching close to 400,000 kilowatt-hours per month. This power is derived from the station of the Dayton Power & Light Company, at Piqua. The plant is equipped for producing both alternating and direct current, the former being principally employed in factories and shops. For producing alternating current the central station contains a General Electric 500-kilowatt turbogenerator and two engine-driven alternators of 200 and 150 kilowatts, respectively; the equipment for generating direct current consists of four motor-generator sets—two of 85 kilowatts each and two of 65 kilowatts. Another feature of the plant consists of a 750-kilowatt frequency changer for converting alternating-current energy purchased from Western Ohio Railway Company, changing same from 25 to 60 cycles. The generators, other than the steam turbine unit, are belt-connected to the shafts of the two Buckeye engines, 600 and 400 horsepower, respectively. The plans of the company, it is understood, contemplate installing another steam turbine and generator in the Piqua station as soon as its new 150,000-kilowatt plant at Dayton is completed, the idea being then to remove a turbine and generator from the original Dayton station to the one at Piqua, which has three 250-horsepower B. & W. boilers for power and a 200-horsepower boiler as a hot-water heater.

The central station at Piqua is the outgrowth of development extending through several periods, having been started originally by the Piqua Electric Company by which the Edison rights were first secured for use in the State of Ohio. Later changes brought the project into the hands of the Miami Electric Company whose interests were subsequently taken over by the Dayton Power & Light Company.

This company recently secured the renewal of a street-lighting contract with the city of Piqua for ten years. Under this arrangement, 200 magnetite arc lamps are to be retained in service, and many new installations will be made, including ten 400-candle power Mazda C lamps and 177 100-candlepower lamps of same design. The direct-current power is produced for service in a limited territory, and for elevator motors in commercial buildings, hotels and plants. Mason H. Lytle is the company's district manager, encompassing Piqua and vicinity.

Of the four underwear-producing factories in Piqua, three use central-station power. Conspicuous among these is that of the Superior Underwear Company which has an individual motor drive for each factory machine, some of the advantages of this arrangement being obviation of power loss due to excessive friction in the group drive, the better speed control, and more flexible conditions generally.

The Piqua Malting Company, which puts into effect a process of malting for brewery use, has a connected load from the central power station of 350 to 400 horsepower, and operates 24 hours per day. Power is used largely in driving fans required in regulating the temperatures, by drawing hot air from the kilns through perforated floors to a contact with the grain.

Central-station power to the amount of 150 kilowatts is used in the factory of the Orr Felt & Blanket Company, although it has its own generating plant in the factory by which a considerable part of the operating load is carried.

The Elgin Tractor Company, which came here from Elgin, Ill., is erecting a 60 by 225-foot factory building, while at present occupying an old structure for factory purposes, in manufacturing a farm tractor. New shop machines and motors will be required for the new shop. The intention is to use central-station energy, of which about 75 horsepower will be required.

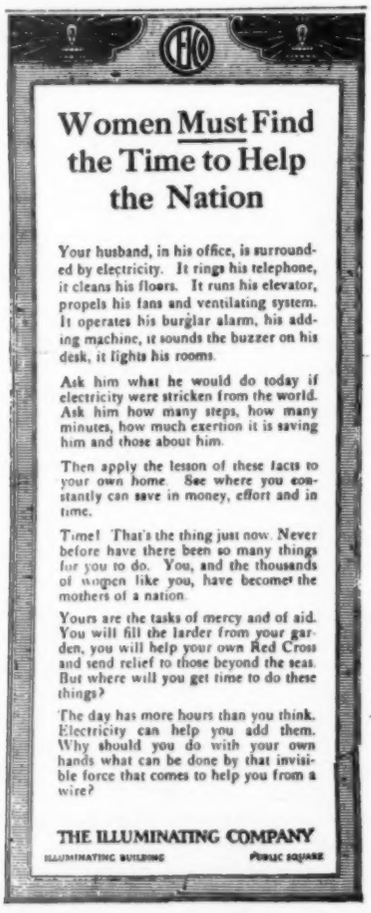
The central station at Piqua also supplies power to three limestone quarries on the outskirts of the town, for the operation of crushers, rotary screens and elevators. The product of these plants is crushed limestone which is shipped to the steel works at various points for use as a flux in the blast furnaces. The finely powdered lime, which results from any crushing and sizing process, is not desired at the steel furnaces; as this accumulates, a part of it is used, along with other material, in surfacing roads. The quarry and crushing plant of the Ohio Marble Company has a connected motor load of about 400 horsepower. Close to 800 tons of stone per day is brought from the pit and passed through the mill. The sizes made are 4 to 6 inch, 2 to 2½ inch, ¾ to 1 inch, and a fine screening. All grades except the last are sacked for shipment. The initial crushing is by an Austin No. 7½ gyratory crusher operated by a 75-horsepower motor. By a system of recrushing and screening, in which three other crushers are used, the required grades of crushed stone are obtained. The limestone body here is a horizontal stratum, 26 feet thick. A pit of that depth covers a number of acres; the quarrying by blasting and steam-shovel work proceeds laterally against a 26-foot bank. The three steam shovels used comprise a Marion, a Bucyrus and a Thew. The stuff is loaded into end-dump cars and hauled by donkey engines to the foot of a bucket elevator by which it is delivered to the crusher. The Stone Products Company is operating on a similar body of limestone in that vicinity, quarrying and crushing 700 tons per day. It uses an Allis-Chalmers No. 7½ gyratory crusher, which is driven by a 100-horsepower motor of the same manufacture.

East St. Louis Company Appeals to Public Through Newspapers.

The East St. Louis Light & Power Company, East St. Louis, Ill., is conducting some direct appeals to the public through the daily newspapers, entitled "Facts About Your Public Utilities." The talks aim to give in some concrete ways the attempts of the local utility company to serve its patrons better. The Urbana & Champaign Railway, Gas & Electric Company is also making direct appeals to the public, asking for the full measure of co-operation, stating that the prices for materials, labor, taxes and other necessities have gone up, in some cases from 200 to 500 per cent, and that the best patronage possible must be given the utility companies if high standards of service are to be maintained.

Cleveland Illuminating Company Appeals to Women to Aid in War Work

A recent newspaper advertisement of the Cleveland (O.) Electric Illuminating Company has attracted considerable attention because of its appeal to the women.


Women Must Find the Time to Help the Nation
Your husband, in his office, is surrounded by electricity. It rings his telephone, it cleans his floors. It runs his elevator, propels his fans and ventilating system. It operates his burglar alarm, his adding machine, it sounds the buzzer on his desk, it lights his rooms.
Ask him what he would do today if electricity were stricken from the world. Ask him how many steps, how many minutes, how much exertion it is saving him and those about him.
Then apply the lesson of these facts to your own home. See where you constantly can save in money, effort and in time.
Time! That's the thing just now. Never before have there been so many things for you to do. You, and the thousands of women like you, have become the mothers of a nation.
Yours are the tasks of mercy and of aid. You will fill the larder from your garden, you will help your own Red Cross and send relief to those beyond the seas. But where will you get time to do these things?
The day has more hours than you think. Electricity can help you add them. Why should you do with your own hands what can be done by that invisible force that comes to help you from a wire?
THE ILLUMINATING COMPANY
ILLUMINATING BUILDING
PUBLIC SQUARE

Attractive Advertisement of Cleveland Company.

Attention is directed to the many uses of electricity in the office and a parallel drawn with the home.

"Your husband, in his office, is surrounded by electricity. It rings his telephone, it cleans his floors. It runs his elevator, propels his fans and ventilating system. It operates his burglar alarm, his adding machine, it sounds the buzzer on his desk, it lights his rooms," says the advertisement, which concludes with the statement that, "The day has more hours than you think. Electricity can help you add them. Why should you do with your own hands what can be done by that invisible force that comes to help you from a wire?"

New York Edison Company Distributes Lightless Night Order.

The sign bureau of the New York Edison Company has reprinted and is distributing to all of its customers a copy of the New York State Fuel Administrator's order regarding sign and advertising lighting.

The various provisions of the order are as follows:

(1) On Saturday nights lighting is permitted, subject to the restrictions imposed by order of the United States Fuel Administration, dated November 9, 1917, and order of the undersigned, dated December 8, 1917.

(2) On all other nights all signs of every kind, including merchants' signs, signs for theaters and all other places of entertainment, display signs, lighting on buildings and elsewhere, hotels and advertising signs, are ordered to discontinue completely.

(3) Stores and offices and commercial buildings not open for business shall not use inside lights more than absolutely necessary for safety. Cluster lights and illuminations generally must be reduced to only so much lighting as is necessary for safety.

(4) No more outdoor lighting shall be used than is absolutely necessary for safety of streets, passages, dangerous places and protection of the public, or as required by law.

(5) No person, partnership, corporation or association furnishing electricity or gas or using the same shall use any coal, oil or gas or other fuel for supplying of electricity or gas, excepting subject to the restrictions and conditions contained in this order.

Electric Heating and Cooking Devices Save Trouble from Gas and Fuel Shortage.

During the shortage of natural gas and coal which Louisville, Ky., in common with other centers in the Central West has suffered, electric heaters have been selling well in that city. Together with electric cooking appliances they have been doing a good deal to provide Louisville people with means of making agreeable homes that otherwise would have been uncomfortable places to live in. "Scores of householders," said H. E. Ottenheimer, manager of the Home Electric Company, Louisville, "put in electric heaters and cookers for emergency use, but, without exception, they will remain in the home. The electric heater and the electric cooker have proved themselves and the Louisville housewifes have learned that they may be depended on when other agencies fail. Our sales of these electrical devices during the blizzard weather were enormous."

The Louisvile Gas & Electric Company, with its fine, modern central-station system, was able to supply the electric loads without difficulty.

Illuminating Engineering Society Discusses School Lighting.—The New York Section of the Illuminating Engineering Society held a meeting January 10, in the Engineering Societies Building, New York City, at which the subject of "School Lighting" was taken up. L. B. Marks, chairman of the Lighting Legislation Committee, presented a paper on the Code of Lighting School Buildings, and C. B. Snyder, superintendent of school buildings, discussed the practical application of the code.

Operating

Remote Water-Level Indicator at Rochester—Treating Boiler Make-Up Water—Ball Bearings Advantageous

MEASURING DISTANT WATER LEVELS.

Electricity Overcomes Mechanical and Physical Difficulties in Measuring at a Distance.

By C. G. Brown.

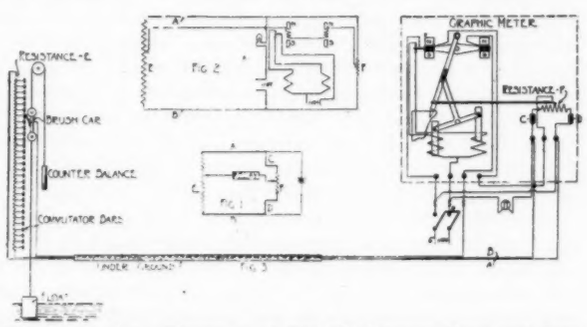
Laboratory Director, Rochester Railway & Light Company.

When hydraulic stations are connected in parallel with one or more steam stations, the hydraulic stations can be used to a larger capacity than if they form the sole source of supply. This is because the operator by watching the level of the water can notice any slight increase or decrease, and then change the amount of water used by increasing or decreasing the load on the machine. If, on the other hand, there were not an unlimited supply of water as is usually the case, and a hydraulic plant were to use all the water available at any one time during a now peak period, there would not be any water available at the time the peak load came on. Since the hydraulic stations of the Rochester Railway & Light Company are tied in with Steam Station 3, it is possible to utilize the full value of the river at those times when the river is comparatively low, but it is very necessary, at such times, for the operator to keep closely in touch with the level of the river above the power house. For this reason the present hydraulic stations are equipped with water level indicators which show the level of the river rather accurately.

The ordinary water pressure gauge, which is the instrument that naturally suggests itself, is hardly applicable where the indications must be received at a considerable distance below the level of the water measured. For example, if the water fall is 100 feet high and the operator is situated 20 feet above the bottom of the falls, the water pressure gauge would register a head of 80 feet of water. A rise of 2 feet in the level would give an increase of only 2.5 per cent in the total reading. But by using an instrument which takes no account of the height of the water above the lower part of the river, that measures the water level from some arbitrary point which is the low-water mark of the upper part of the river, it is possible to have the river level indicated more accurately. For example, suppose the maximum rise in level is 10 feet, and that on one particular day the rise was 2 feet. As the full scale reading of the meter has been calibrated for 10-foot rise, the indication for the 2-foot rise will be a 20 per cent deflection instead of one of 2.5 per cent as with the water pressure gauge.

The principle of operation of the instrument may be explained as follows: In Fig. 1 a relay is shown with lines connecting on the right and left to resistances. The resistance on the left is the one which is at the dam and the pointer alongside of it is a contact which is controlled by the height of the river. The relay is so made that it will remain stationary if the one contact is the same proportion of the length down its resistance as the other contact is down its resistance. If, however, these two contacts are not the same proportional part of the way down the resistance, a current will flow through the relay and cause one of two contacts to be made, causing a current to flow through one of two solenoids as shown in Figs. 2 and 3. These solenoids in turn cause the pointer to move and show the elevation of the water; it also causes the contact to slide along on the coil F, thus tending to restore the electrical equilibrium of the circuit. When this happens, there will no longer be any current going through the relay and the solenoids will no longer act until there is another disturbance of the balance caused by the change of the level of the river. In order to operate this contact along resistance "E" a float is to be placed in the settling chamber, where the water is quiet, and yet at the same level as the water outside.

The following explanation refers to either Fig. 1, 2 or 3: "A" and "B" represent wires connecting the operating house at the dam with Station 5. "E" represents the resistance at the operating house. "F" represents the corresponding coil at the instrument in



Figs. 1, 2 and 3.—Diagrams of Electrical Connections and Principles Involved in the New Water Level Indicator at Station 5.

the power house. "C" and "D" (Fig. 3) are placed on the power house side of the connections from the battery to balance the resistance of "A" and "B."

If the connection from the relay to resistance "E" is one-tenth of the way down from the top of resistance "E," and if the connection from the relay to resistance "F" is also one-tenth of the way along resistance "F," then no current can flow through the relay. On the other hand, if one of these points is higher than the other, a small current will flow through the relay and the direction of this current will depend on which one of the two points is higher than the other (Fig. 1 or 2). This coil "F," which is a small coil only about 6 inches long, may be seen in a horizontal position at the right-hand side of Fig. 3.

To determine the level of the water, a float is to be placed in the settling chamber which will have in it water which is quiet, and at the same level as the river outside. Directly over this float there will be an I-beam attached to the wall in a vertical position. This I-beam will have its face covered with a long strip of fiber which will be used as an insulating medium, and

attached to the fiber will be about 220 commutator bars placed in a row, one over the other. The carriage will travel up and down on the I-beam as the float rises and falls, thus making contact with one or another of the various commutator bars. The commutator bars will be connected together with small wire of comparatively high resistance. This will correspond to the resistance "E" in Fig. 3. A brass spring which is connected with the relay at the power house makes contact with the commutator bars as the carriage travels up and down the I-beam.

In the water level indicators formerly installed at the company's hydraulic plants resistance "E" was made only about 6 feet long because the change in water level was only 6 feet. A short resistance like that could be made by wrapping iron wire about a cylinder made of some sort of insulating material. The contact to this coil was made by a brass strip resting directly on the coil. In the new water level indicator the commutator bars are used, as explained above, since it is necessary to measure a total rise or fall of 10 feet in the level of the river, and it would be difficult to wrap a coil which would be substantial and at the same time straight enough to be used in the old method.

In regard to the present installation, the distance between the dam and the power house is so small that it is not necessary to pay a great deal of attention to the resistance of wires "A" and "B."

Three wires will have to be run from the dam to the power house, as can be seen from Fig. 3. As interruptions of the indications cannot be tolerated, this three-wire circuit will be run in underground cable, going submarine where it is necessary to cross the river between the two stations. Although Fig. 1 shows the source of electromotive force as a storage battery, actually direct current from the Edison service will be used, as this saves the troubles of maintaining and supervising the battery. The 110 volts from the supply circuit will be cut down by inserting a lamp of the required resistance to give 10 to 20 volts.

Although no mention has been made of the fact, a permanent record is kept of the water level at different times. The same needle moves back and forth at the power house to show the water level at any time, carries a pen across a slowly moving strip of paper. The paper moves vertically while the pen moves from left to right and vice versa as the water in the river goes up and down, and a zig-zag line is drawn on the paper, making a permanent record which can be filed away for future reference in telling past conditions and what may be expected at corresponding seasons of the year.

The water will usually be rather high in the river and most of the reading done from the instrument will show a level within 5 feet of the highest level. If the scale were uniform throughout the full 16 feet, only a comparatively small part of this strip of paper would be used and the readings would not be as accurate as might be desired. In order to overcome this difficulty, the resistances connected by commutator bars will not all be uniform. Those at the top 6 feet will each be three and one-third times as high a resistance as those of the bottom 10 feet. Since the action of the relay depends on the relative amount of resistance above and below the contacts of resistances "E" and "F," a motion of 1 foot of the contact along the upper part of coil "E" will have three and one-third as much effect on the coil as would a motion of 1 foot near the bottom of coil "E." Since this is the case, it is planned to have a special scale which will show a magnification for the upper 6 feet. A special ruling will also be provided for the paper to be used in this instrument as it would otherwise be somewhat confusing to read the chart months or years later.

The instrument used for the water level record is made over from a Westinghouse graphic ammeter. The principle changes necessary in order to make it suitable for a water level indicator are to disconnect it from the ammeter shunt (thus making it a millivoltmeter), disconnect a spring from the inside of the meter (thus making it stay at rest only when the current is zero), and attach an auxiliary coil on the right. These changes, together with the wiring, are the principle changes required.

It will be noticed from the above description that the interesting part of this instrument is that it makes a record of the motions up and down of a float some distance away. An exactly similar device could be used to reproduce the motion of a meter also at a distance. A comparison between the above and the duplication of wattmeter readings at Station 3 of the wattmeter installed in Station 33 is interesting because this latter installation operates on an entirely different principle. Instead of using direct current it uses alternating current; instead of operating on the principle of balanced resistance, it bases its action on reactance; instead of being a meter which is only at rest when some particular wire has a zero current flowing in it, the meter at Station 3 is based on the principle of being at rest when two wires have equal current flowing in them.

[The above description is published through the courtesy of the Rochester company's *Gas & Electric News.*]

TREATING BOILER MAKE-UP WATER SELECTIVELY.

Convenient Method of Treating Make-Up Water Without Chemical Purifiers or Evaporators.

By Lionel Linnell.

Dirty, impure water, that is water carrying foreign matter in suspension or solution, causes dirt and sludge and scale to settle and form on the surfaces of shells and the cooler heating surfaces of a boiler and a harder scale on the hotter portions. Where water is dirty it should be filtered; where impure in that substances are in solution it should be purified. Either of these can best be done outside of the boiler. It is less trouble and more efficient to use the boiler for evaporation and a purifier for purifying, each performing its proper function, rather than attempt to combine the two purposes into one piece of apparatus. The objections of scale are well known, the loss of boiler efficiency due to reduced heat transfer between furnace gases and boiler contents; the corrosion of boiler surfaces and crevices due to acid and mechanical weaknesses such as are liable to occur on account of hot spots resulting from restricted heat transfer. The methods of removing deposits and scale from boiler heating surfaces are also well known—water treatment, use of graphite to prevent scale adhering to the heating surfaces, various methods for removing scale once it forms, tube cleaners, etc. The use of all these things takes time, and capacity can be ill-spared during these days of overloads and long working-hours, not to mention lack of labor, while the loss of boiler efficiency due to scale and the dangers of ruptured tubes are always important items.

The subject of preventing scale upon boiler heating surfaces is always an important one. But it is even

still more important when operating boilers at so-called high ratings. Normal rating is usually considered as being an evaporation of 34.5 pounds of water per hour from and at 212 degrees for every 10 feet of boiler heating surface. In practice this amount is being doubled and trebled daily in many boiler rooms; and where it is a matter of evaporating 60 and 90 pounds of water per 10 feet of heating surface it can be understood the necessity for pure water, free from scale and vegetable acids, becomes of even greater importance because of the larger quantity of water involved and strains to equipment. Scale on the tubes nearest the fuel bed may cause bags and rupture under the intense heat of the furnace gases that play with an effect similar to a blow torch upon the bottom tubes of the first pass of the boiler. Moreover, these gases have higher velocities than when the furnace is working at lower rates of combustion, hence clean and scale-free heating surfaces are necessary unless considerable heat is to pass unutilized up the smoke stack. Scale interferes with efficiency and safety, especially at high rates of boiler evaporation.

Evaporating water in a boiler is an effective way of purifying water, namely distilling it, but in practice where water is sufficiently impure to require treatment, as already pointed out, chemical purifiers or evaporators are usually employed. Feed-water heaters for the less injurious waters are often used. The feed-water heater only accomplishes purification to a certain extent, the action of the open type heater being different to the closed type of heater, since the one works with the lower temperature of exhaust steam, the other at the higher temperature with live steam. The open type heater is useful for reducing the magnesia, lime and carbonates that precipitate at the temperatures of exhaust steam whereas the closed type heater can be used for precipitating down the sulphates, etc., which precipitate down at higher temperatures than are available with exhaust steam. However, this is not a discussion of the advantage and disadvantage of the open and closed-type feed-water heaters.

Where a plant operates non-condensing the water evaporated is not recovered and thus water must be fed to the boiler as fast as it is turned into steam. On the other hand, a plant operating condensing evaporates a large portion of the same water a number of times, due allowance being made for loss. For example, in a plant using turbines the steam passes from boiler to turbine, through the condensers back to the boilers. Not all condensed steam returns as water, however, for some steam is lost through boiler blow-off valves, leaky steam flanges, valves, leaky condenser, pump, etc. The amount of water lost in this way depends, of course, upon the plant, how efficient it is and how well maintained. Now in a plant running condensing, using water so impure that it requires purifying, it is not the total water evaporated per hour that must be purified but the amount of water that is lost per hour, or the make-up water, that must pass through the purifier. Where chemical purifiers are used the need for minimizing the loss of condensate is apparent, apart from the loss of heat it represents.

When feed-water is chemically treated all boilers behave alike since the water is as pure in one as in another, and thus all are subjected to identical water conditions. The same is the case where the feed-water is not treated, for here too all units must be taken out of service and cleaned according to amount of sludge and scale formed. The frequency with which this is necessary depends amongst other things upon the condition of the water, the boilers, the rate of evaporation and amount of water evaporated. On the score of continuity of service as well as cost of labor and waste of water and heat it is particularly desirable to keep all units in service without interruption at this time. One way is to reduce the amount of scale and impurities carried over into the boiler by the feed-water. The selective treatment of make-up feed-water is a convenient way of accomplishing this, and cheaply where chemical water-treating equipment is lacking.

Suppose that after a careful measurement of steam produced as indicated by steam-flow meter and feed-water used for make-up as indicated by water meter it is found that the make-up water amounts to, say, 5 per cent. Suppose further that all boilers could be operated continuously at 250 per cent rating if the water were pure, but lack of water-treating apparatus prevents the make-up water being treated in a way that would remove the limitations as to further forcing. If now instead of feeding the make-up water into any and all boilers indiscriminately the make-up water were fed to one or perhaps two of the units these one or two boilers could operate at 100 or 150 per cent or any other convenient rate of evaporation, using almost entirely make-up water. This make-up water would be evaporated into steam, used by the turbines, pass into the condensers and 95 per cent of it return to the balance of the boilers again for further use. The one or two boilers operating at lower ratings would act as evaporators or water-treating units for the balance of of the boilers. The limitations as to forcing of the remainder of the boilers due to impure water would cease to exist. The necessity for such frequent shutting down of the individual boilers for removing scale and sludge, and frequent blowing down for riddance of sludge would also be reduced.

In these days of heavy loads and high ratings, labor scarcity and high cost of equipment and chemicals the above method of treating boiler make-up water is worthy of consideration. It may be found the station steam-making capacity can be increased by operating one boiler or more at easy ratings while using it or them as water-purifiers, and thus enabling the remaining units to operate at increased capacity. It will certainly reduce the frequency with which the boilers otherwise would have to be shut down for cleaning out; and lessens the likelihood of burst tubes, an increasing occurrence of late where dirty water and high ratings are in vogue. Moreover, it may enable the use of a chemical treating plant to be dispensed with. It is really a matter of whether all boilers shall be affected by impure water or whether the scale and sludge shall be restricted to only a few, by using one or more boilers as evaporators as well as boilers at reduced output.

Ball Bearings Effect Savings.

Ball bearings once considered only for special purposes, can now be found in many unexpected and surprising places. Their use usually enables higher speeds, reduces friction losses and simplifies design. Large electrical machines are adopting ball bearings because of the lower static and running friction, lower starting and running currents. Ball bearings often enable reduced overall machine dimensions, making for a cheaper machine that overcomes space restrictions. Ball bearings are now being used where dirt and grit and infrequent inspection make other bearings troublesome and expensive as with locomotives for coal haulage. Even mechanical stokers are adopting ball bearings, a class of extremely severe service. Ball bearings conserve energy, reduce trouble and save repairs and lubricant expense, while permitting higher speeds and loads with higher over-all efficiency.

Construction

Conduit-Bending Practice—Banks Need Reliable Burglar Alarms—Testing Compound Motors—Among Contractors

METHODS OF BENDING CONDUIT.

First of a Series of Articles Describing the Best Practice.

By Terrell Croft.

In Forming a Right-Angle Bend with a Hickey, the first step is to ascertain, by measurement with a 6-foot folding rule at the place at which the conduit is to be installed, just where the bend should be located in the conduit. Then the distance (shown as *D* in Fig. 1) from the end of the tube to the outside of the bend which is to be formed should be marked on the floor by drawing a line (*AB* in Fig. 1) with a piece of chalk. (It is practically useless to endeavor to make a bend accurately in a piece of conduit by marking the bending point on the conduit itself, as shown in Fig. 2; much time has been wasted in attempts to use marks

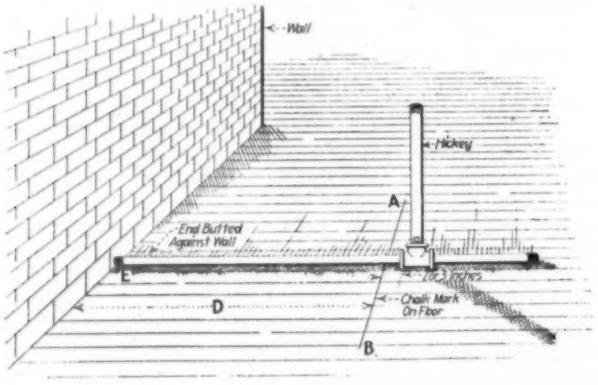


Fig. 1.—First Operation in Forming a Bend with a Hickey. Distance from Outside Bend to Wall Has Been Laid Out on Floor.

on the conduit, chiefly because the mark is covered by the hickey.) Now, butt that end of the conduit (*E*, Fig. 1), near which the bend is *not* to be made, against a wall, post or similar vertical member of the

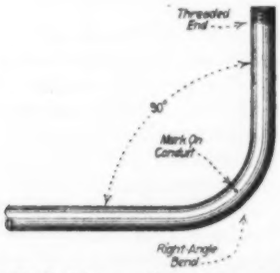


Fig. 2.—Showing Chalk Line or Center-Punch Mark on Conduit. An Unreliable Method of Marking.

building. Place the hickey over the other end of the tube at a location about two or three inches outside of the mark on the floor, as indicated in the illustration. Next, stand on the conduit just inside of the location mark on the floor and pull over the hickey, drawing the conduit end through an angle of about 20 degrees, as diagrammed in Fig. 3. And, still standing

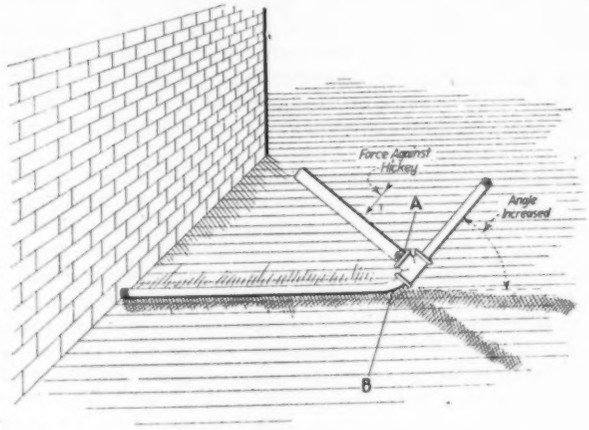


Fig. 3.—Second Operation. The Bend Started.

on the conduit, move the head of the bender along the conduit toward the wall about one inch and bend the tube a little further (Fig. 4).

Repeat this process until the turn has assumed the

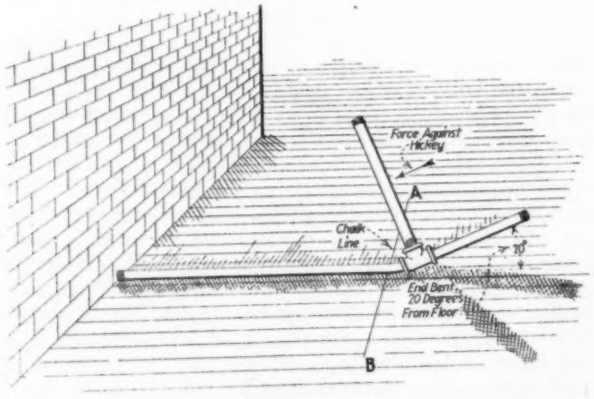


Fig. 4.—The Bend Partially Completed.

contour desired and until the outside face of the bend is in vertical alinement with the chalk mark made on the floor, as indicated in Fig. 5 at *MN*. It may be necessary in finishing the bend, so that it will occupy just the right position in the tube, to invert the hickey and use its handle as a lever on the tube, as diagrammed in Fig. 5.

It is not ordinarily feasible to form with one hickey a bend of the desired contour and in the desired location with one position of the tool on the conduit. The process is essentially a cut-and-try one. A little practice is all that is necessary to render any one proficient. If the bend first formed is of too long a radius,

the difficulty may be corrected by following the procedure in a later installment of this article.

The Radii to Which Bends Should Be Formed will be determined by the local conditions affecting each

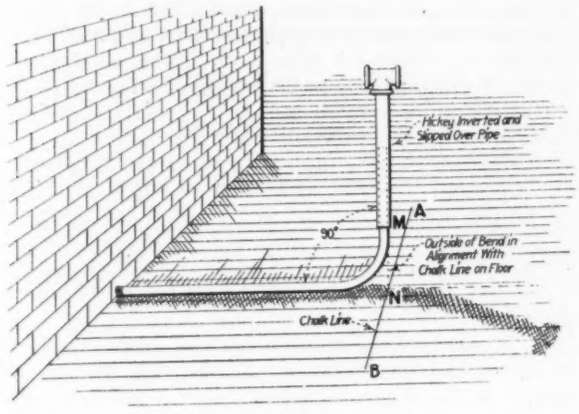


Fig. 5.—Finishing the Bend, Using the Inverted Hickey as Lever.

case. As a general rule, it is desirable, to insure ease of manipulation and the pulling in of the conductors with minimum effort, that the radius should be as large as possible. In the National Electrical Code it is specified that the minimum radius of the inside of any bend should be 3½ inches. This value should certainly be taken as a minimum where the bend is in a long conduit run. But where the distance between outlet boxes is short and where there are not more than two bends in the run, the shortest-radius bend which it is possible to make will ordinarily be accepted by wiring inspectors.

(To be continued.)

INSTALLING BURGLAR ALARMS FOR BANKS AND JEWELRY STORES.

Unusual Opportunity for Contractors to Help Protect Communities from Criminal Class.

In the last month or so a considerable number of very bold burglaries and hold ups have been committed in banks in various parts of the country. The losses have become so serious that the Illinois Bankers' Association has sent to all its members a special bulletin on the subject urging every bank to adopt vigorous measures for its protection. Among the recommendations is one that each bank install an electric alarm system with push buttons at various locations in the banking room and special contacts in the floor surrounding the vault or safe, these being set to actuate the alarm circuit at the approach of any one. It is also suggested that circuit wires be run in conduits underground to neighboring stores to arouse adjoining merchants.

This matter calls to mind the opportunity of electrical contractors to aid in installing electrical protective systems. The large banks in large cities have very elaborate alarm and protective systems connected with the police department, the telephone company's lines, and private alarm circuits for the banks' officials and watchmen. The smaller banks, however, have had either very meager alarm systems or none at all, consequently they have become easy victims to the vicious criminals that infest the large cities and from them make raids on the smaller communities. Jewelry stores also have been specially picked out for some of the boldest attacks. Wherever reliable electrical systems have been installed they have proven of the greatest value in either sounding such vigorous alarms that the marauders were scared and ran before they could carry out their burglarious acts, or were caught red-handed by the arrival of merchants or other citizens that were aroused in the immediate neighborhood. This has especially been the case in western towns that formerly were on the frontier and were therefore especially exposed to raids from criminal bands.

The situation is clearly one in which electrical contractors can come to the help of the community by installing dependable alarms. This opportunity is open only to contractors whose established reputation is an assurance of reliable work. Likewise the contractor should send out on such work only his most dependable men, those who are not only skilled and careful wiremen, but whose reputations are above suspicion of friendship for the criminal element.

It is necessary in practically all cases to put in a closed-circuit system, because an open-circuit system can be interfered with too readily by cutting of the circuit wires, unless these are run in conduit. Provision should be made for readily testing the alarm system without causing all of the gongs, bells or other signals to be sounded. In some cases this can be done by means of special single-stroke test bells, in others by means of test lamps. By conspicuously exposing one or more, but not all, of the alarm gongs in a not readily accessible place, as above the store front or near the ceiling inside, this alone will act as a deterrent to the criminals. The wiring in all cases, however, should be carefully concealed, and preferably run in conduit even when a closed-circuit system is installed.

The principal advantage of a closed-circuit system lies in the fact that any attempt to cut contact wires instantly sets off the alarm, as does any defect or derangement of the contact circuit. It must be noted, however, that this applies only to the circuit containing the contacts, which must contain a closed-circuit battery or other suitable source. The operating or alarm circuit, which contains a relay, the various gongs or other signals, and the alarm battery, is an open circuit, however; this means that it must be especially protected against tampering, as by running its wires in conduit, concealing its battery, relay and most of its signals. If some of the latter are intentionally exposed, as before mentioned, they should be connected in parallel (not in series) with the other signals.

By taking due precautions it is possible to install a foolproof and reliable alarm system that will prove the undoing of the burglar, hold-up and safe blower. Equipment for such systems is available on the market that is both dependable and moderate in price. Nevertheless, price should be a minor consideration to reliability. The outlay of $100 to $200 or more, depending on the size of the installation required, is a cheap insurance against bank robberies that might represent the loss of many thousands of dollars besides the hazard to the lives of bank officials and patrons. At the rate at which bold daylight robberies and crafty safe-blowing jobs have been committed recently, the rates for burglar insurance have had to be raised very materially. The electrical contractor can therefore find many opportunities to install alarm systems in banks, jewelry stores and other commercial establishments and aid the community to rid itself of a serious menace. Especially now that regular construction work is at low ebb, the contractors should lose no time in rendering this service.

Test for Cumulative and Differential Field Windings of Direct-Current Compound Motors.

By T. H. Reardon.

In practical electrical work direct-current machines are frequently changed around to meet varying requirements or to take care of emergencies. A machine that has been used as a generator will, for example, be put into another place where it will be run as a motor.

In the case of compound machines one matter that must never be overlooked is the fact that the series and shunt windings may be so connected that they assist each other in building up the field or they may act in opposition to each other, constituting what is known as the differential winding in which case the field strength is the net result due to the shunt ampere-turns minus the series ampere-turns.

In a particular case recently a 110-volt 180-ampere direct-current generator was changed to another place and used as a motor. The operation was very unsatisfactory for quite a long time, the load varying widely, speed fluctuating and fuses blowing as soon as they were inserted after starting up.

With a view to ascertaining whether the series winding was assisting the shunt winding or opposing it the following scheme was tried: The belt was thrown off the pulley, thus making the motor run light by throwing the load off. The shunt-field circuit was opened, the switch thrown in and the lever on the starting rheostat was carefully moved up 3 or 4 points. The rotation was counter clockwise. The original rotation was *clockwise*, showing that the motor in trying to obey the series field was tending to run backward, but owing to the superior strength of the shunt field it ran forward but with a greatly diminished torque.

The series winding was corrected by interchanging the terminals at the motor terminal block so that series and shunt excitation were in harmony with each other and there was no further trouble in the operation. The motor speed diminished about 100 revolutions per minute, it being about 780 revolutions per minute before the changes were made. The speed reduction of course followed as the result of a stronger field and it necessitated the use of a pulley of larger diameter in order to secure the correct speed on the driven apparatus.

This peculiarity in the field could, of course, be tested out by other methods, but it often happens that the other methods cannot be used, either because they are not understood or because the particular testing apparatus required is not at hand.

In making the test as described it will be necessary beforehand to consider whether the brushes are liable to be thrown out in case the motor runs in the opposite direction. In a great many motors the brushes are all right for rotation in either direction but this is not necessarily true in all cases.

In cases where it is impracticable to throw the belt off and make the motor run light, current can be sent through the shunt winding and the series winding separately and the resulting polarity can be determined by means of a small compass held close to the poles.

The motor speed at full load should enable anyone to decide whether the windings were cumulative or differential, being high for differential and low for cumulative effect except in so far as the motor will slow down under load on account of weak field and reduced torque.

Among the Contractors.

Smith & May, Kewanee, Ill., have been awarded contract for wiring the new water-works plant in that city.

Fitch Electric Company, 1005 East 105th street, Cleveland, Ohio, has received the wiring contract for a large new residence for Mrs. S. S. Taylor of that city.

The Tri-City Electric Company, Service Building, Moline, Ill., sent out to its many friends a cleverly prepared card transmitting its high-tension line of holiday greetings. At one end is represented the company's manager, W. J. Ball, harnessing a generator and its circuit; his perfect control and the generous stock of materials in the big Tri-City Electric catalog at his side show his ability to serve his patrons' electrical needs and give force to his message, "Let Us Do It."

J. A. Atwood, electrical contractor, Dayton, Ohio, has practically completed the wiring for lighting and motors in the new Engineers' Club building in that city, his contract amounting to about $5000. A large contract for residence wiring involved the work on 22 houses for the Adam Schantz estate, all these being high-class buildings, which are to be completed by March 1. Mr. Atwood has also carried through a contract for wiring the Charles Siebold residence, costing $150,000. The wiring was for lighting, electric stoves, pumps and vacuum cleaners.

Reed & Reed, Lima, Ohio, are wiring the new Country Club at that place. Their biggest work during 1917 was the wiring of Lima's ten school buildings, nearly all of which are old buildings which had not previously been wired for lighting. In this work the conduits used were those made by American Conduit Manufacturing Company, Pittsburgh. When this contract shall have been completed the school buildings of Lima will be modern with respect to illumination and ventilation. This firm combines electrical appliance merchandising with contracting on buildings and manufacturing plants.

A. H. Cox & Company, 307 First Avenue South, Seattle, Wash., are installing a 650-horsepower electrically operated pumping station at Prineville, Ore., for Twohy Brothers, contractors of Portland, also one of similar size at Bremerton, Wash., for the Puget Sound Bridge & Dredging Company, of Seattle. They are also installing all the electrical apparatus in the plant of the Seattle Can Company to the exent of 250 horsepower, the motors varying from 3 to 50 horsepower. All the machines are arranged for individual drive operated by constant-speed three-phase 440-volt motors fully equipped with overload and no-voltage releases.

The Wentworth-Dean Company, Lima, Ohio, is furnishing and installing the switchboard and transformers for the new generating unit being installed by the City of Lima in its power house and main pumping station. The switchboard is to have four panels for power and light, and has been purchased from the Kuhlman Engineering Company of Toledo. The transformer is of Moloney make. This company also has the contract for installing the motors in the new pumping plant which the city is putting in at its new reservoir, as well as control panels for same. Another contract is for wiring the St. Rita Hospital, in Lima, in which it will also install motors for the laundry, ice machine, elevators and vacuum cleaners. Still another contract in hand is for wiring South High School, Lima, and the installation of 47 motors ranging from 1 to 25 horsepower.

New Appliances

Table Stove—Toggle Switch—Best Plug—Willis Radiator —Inclosed Switch—Brakes—Cutler-Hammer Developments

Rutenber Electric Table Stove.

The convenience of electric table cooking for light breakfasts, luncheons or supper is becoming better appreciated daily and, with the demand for electrical equipment for this purpose steadily increasing, manufacturers have provided table stoves, grills, etc., of greater utility than ever. Notable in this connection is the new Rutenber electric table stove illustrated herewith. This is a three-heat stove of 660 watts rating that will do anything in the way of general table cooking possible with any larger appliance, although, of course, in a smaller way. It is found to be an ideal appliance not only for breakfast and luncheons, but also for doing practically all the cooking required by many people in light housekeeping.

Rutenber Electric Table Stove with Accessories.

This stove has a square cooking surface 7 by 7 inches, which is a size and shape found especially suitable by many housewives. It is very convenient for grilling bacon, ham, steaks, chops or other meats, and can be used to bake biscuits, muffins, cup cakes or cookies by placing the two large pans above the heating cock and the reflector pan underneath the heating coils. There are also four custard cups, which can be used for poaching eggs or steaming custards or other puddings. The device can also be used for toasting bread, either above or below the heating coils, for frying eggs, etc.

This table stove weighs about four pounds. It is made by the Rutenber Electric Company, Marion, Ind.

Hubbell Toggle Surface Switch.

A surface switch of the toggle or lever type has been placed on the market by Harvey Hubbell, Inc., Bridgeport, Conn. It differs from the snap surface switch in its manipulation, being by means of a toggle or lever instead of a key or button. Throwing the lever up closes the circuit; throwing it down opens the circuit. This makes the switch self-indicating without a dial. The switch movement is positive and snappy and the mechanism is of substantial construction. Its rating is 10 amperes, 125 volts, or 4 amperes, 250 volts.

New Hubbell Toggle Snap Switch and View Showing Interior of the Single-Pole Switch.

Aside from the indicating feature of the switch, it has the advantage of having a more convenient manipulation than that of turning a key; it is also a stronger and more attractive switch than the ordinary rotary switch. The switch conforms to the most rigid requirements of switch practice. It is made in single-pole and three-way patterns.

Porcelain Outlet-Box Receptacles.

The Arrow Electric Company, Hartford, Conn., has just placed on the market an outlet-box receptacle with a removable porcelain ring grooved for a shade-holder. This shade-holder groove is the new feature of the device, as the receptacle base is nothing more than the standard short type of sign and outlet-box receptacle, which has been on the market for a number of years.

Receptacle with Shade-Holder Ring.

The ring is threaded sufficiently to support a considerable weight, and it can be fitted to bases, for ordinary cleat wiring, for weatherproof work, and for concealed terminals.

Diamond Soot Blowers Save 2,200,000 Tons of Coal in 1917.

A recent statement by the Diamond Power Specialty Company, Detroit, points out that its mechanical soot blowers saved the nation 2,200,000 tons of coal during 1917 by keeping heating surfaces clean, and in this way enabling more efficient heat transfer from furnace gases to boiler heating surfaces. This company reports at a conservative estimate about 11,000,000 boiler horsepower in the United States are being maintained efficient by Diamond soot blowers. If these boilers average 2500 hours operation yearly, and allowing 4 pounds of coal per boiler horsepower per hour, the coal consumption will be in the neighborhood of 55,000,000 tons. Both the above estimates tend to belittle the coal consumption.

The Diamond soot blower will save 4 per cent, and often 8 per cent, of the fuel burnt by preventing the adherence of soot upon the heating surfaces, which for the above coal consumption represents a saving of 2,200,000 tons of coal annually when figured on 4 per cent basis. Expressed in dollars this represents a

financial saving in the fuel bill of between $8,000,000 to $9,000,000. With normal loading, railroad congestion and car shortage have been reduced to the extent of 44,000 carloads of coal.

New "Jiffy Junior" Composition Attachment Plug.

A new solid attachment plug, called the "Jiffy Junior," has just been put on the market by the Best Electric Company, of Pittsburgh, Pa. The new plug is a solid piece (with separate tip) of asbestos composition. The terminals are molded right into the plug, and the brass screw shell is die-stamped permanently into place, giving it a most substantial construction. By loosening one screw, the tip is removed and the plug is open for wiring. The wires are then cut to

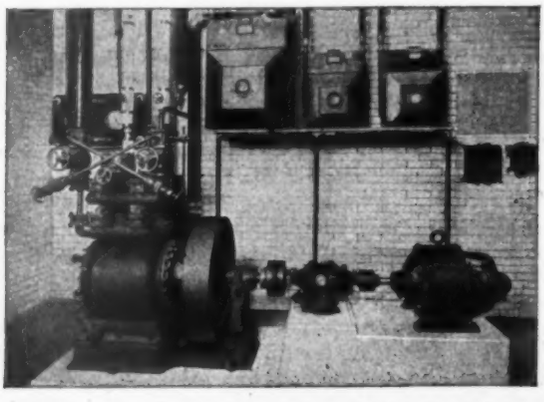
The "Jiffy Junior" Attachment Plug. Second View Shows Wires Attached to Terminals, Which Are Accessible on Removing a Single Screw.

even lengths; no knots are necessary, as the right-angle strain reliefs securely hold the wires.

This plug has the advantage of being quick and easy to wire. It is wired in the open; one screw holds the plug together securely. Its simple design makes it impossible to wire or assemble wrong, and also makes it a practical plug of great economy. Being made of asbestos composition, the "Jiffy Junior" is practically indestructible, and is a safe plug to use with any portable electrical device.

Speed-Reducing Gear for Turbine or Motor-Driven Machines.

Certain kinds of rotating machinery operate at best efficiency at speeds very much below the most efficient speed of the driving turbine or motor. Special speed-reducing gears of compact construction have therefore been devised for connecting the driving and driven machines, thus making a very economical combination. One of these is illustrated herewith. It is used for a variety of purposes, including the drive of low-speed direct-current generators, pumps, blowers, fans, etc., from high-speed steam turbines, from which it receives the name of the Turbo-gear; among other uses are similar drive by high-speed motors and turbine and motor drive of air or ammonia compressors.



Turbo-Gear Interposed Between Driving Motor and Ammonia Compressor in Consolidated Gas, Electric Light & Power Company's Building.

The accompanying illustration shows an installation of this kind. It is in the fine office building of the Consolidated Gas, Electric Light & Power Company of Baltimore; a 7.5-horsepower motor operating at 1150 revolutions per minute drives a Brunswick ammonia compressor at 193 revolutions per minute through a Poole turbo-gear. This outfit is used for cooling the drinking water supplied throughout this large building. This set has been in operation for some time and is noted for its quiet operation, which is in marked contrast to the usual gear drive. It is also a very compact and efficient gear.

These gear sets are made for various reduction ratios and sizes by the Poole Engineering & Machine Company, Woodbury, Baltimore, Md.

Willis Electric Radiators.

The ideal method of heating a room is by means of electric heat applied through radiators of fairly large heating surface so that a large volume of air is raised to a moderate temperature, this being regarded as preferable to heating a smaller volume of air to a

Willis Six-Section Portable Nitrogen-Filled Electric Radiator.

rather high temperature. Such a device possesses the important advantages of decided convenience, healthfulness since no air is vitiated or overdried, and safety because no flame is used.

These principles are carried out in the Willis electric radiators made by the Willis Manufacturing Company, Cleveland, Ohio. In appearance they resemble small steam radiators, without pipe connections, however. In design they are quite novel in that the heating element is contained in the lower portion of the radiator and this heats an inert gas—nitrogen—which fills the radiator sections, circulating through them and carrying the heat to all portions of the surface. This

construction, together with the hermetic sealing of the radiator, eliminates deterioration of the element due to oxidation when exposed to the air and therefore insures unusually long life.

The Willis nitrogen radiator is made of pressed steel neatly finished. It is made with 4, 6, 8 or 10 sections, the radiators ranging in weight from 13 to 23 pounds; this makes them readily portable and yet not easily upset. The height and width in each case are 14 inches and 4¾ inches, respectively; the length varies from 9½ to 21½ inches, depending on the number of sections. The power consumption for the four sizes is 400, 550, 700 and 850 volts, respectively.

These radiators are designed principally for use as auxiliary heaters, for example, for assisting the heating equipment installed, especially when fuel supplies are low or when insufficient heat is supplied on very cold days; they also serve to take the chill off rooms in spring and fall before the regular heating system is in use. Their operating cost is quite low and their use makes for fuel conservation and economy.

Improved "Safety-First" Inclosed Lever Switch.

The General Electric Company, Schenectady, N. Y., has recently introduced an improved inclosed lever switch that may be classed as a "Safety-first" device in every respect. The device has been examined by the National Board of Fire Underwriters and approved from the standpoint of both fire and casualty hazards.

The switch is especially adapted to the control of motor drive on machine tools or for lighting and power circuits. The switch uses National Electrical Code standard cartridge fuses and is limited in capacity only by the rating of approved fuses of this class.

The phantom view here reproduced shows a triple-pole switch of this type. The unit consists essentially of an externally operated standard lever switch inclosed in an iron case, and so arranged that all current-carrying parts are inaccessible while alive. This feature is secured by means of a simple interlock so arranged that the cover to the fuse compartment cannot be opened while the switch is closed, nor can the switch be closed while the fuse compartment is open. The screws holding the main cover to the box are covered by the fuse cover so they cannot be removed while the fuse cover is closed.

The operating mechanism is very simple. The handle on the standard lever switch is replaced by a hook-shaped casting which engages with a curved shaft operated by the externally mounted handle as shown. Raised letters on the box indicate the open and closed position of the switch.

Provision is made for locking switch in the "off" position with from one to three individual padlocks. Means are also provided for padlocking the fuse cover to prevent unauthorized persons from tampering with the fuses.

The switch box is provided with knockouts for conduit wiring, two knockouts being placed at each end and two at each side of the box. Split porcelain bushings to protect the wires in open wiring work are supplied, two at each end for two-pole, three for triple-pole and four for four-pole switches.

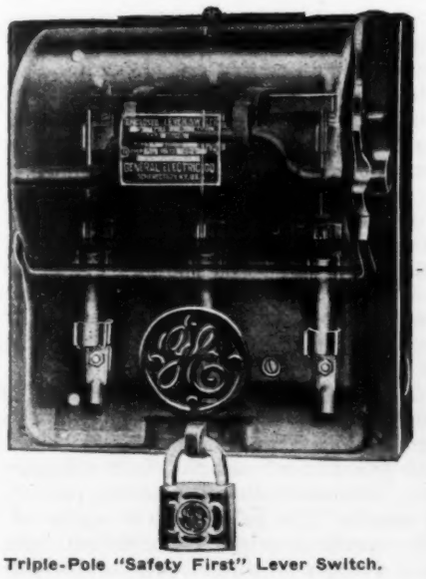
The switch is adapted to single or group mounting, and when mounted in groups may be provided with a bus compartment for inclosing all incoming wires and connections.

Another accessory is the safety catch. When this catch is used the operator cannot close the switch without using both hands, one to hold the catch in the released position, and the other to operate the switch handle, thus removing the possibility of accidental closure.

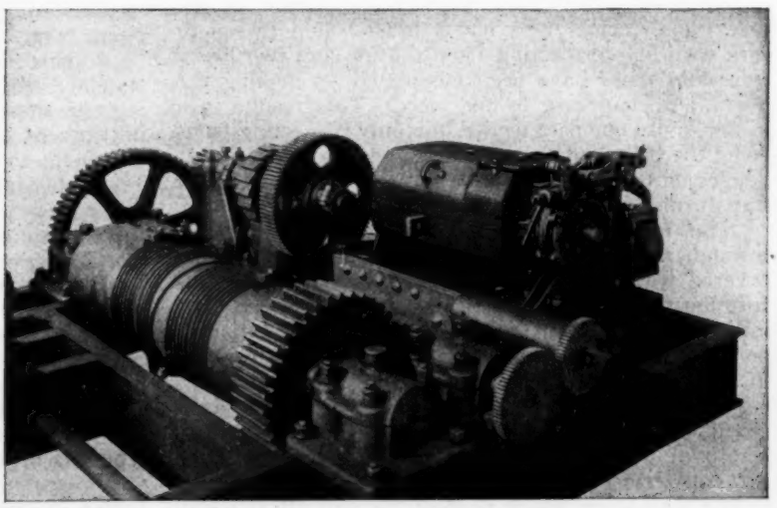
New Types of Westinghouse Magnetic Brakes.

The principle of the type of magnet which has been so successfully incorporated in the design of magnetic controllers by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has been employed by the company in a new design of magnetic brakes just developed for use with mill, crane and hoist motors. The use of a clapper-type magnet eliminates all moving parts within the coil and the consequent wear, sticking or damage to insulation. The modified and improved type A alternating-current brake with which the trade is already familiar and the new type B direct-current brake are similar in operation and have common parts throughout except for the armature lever and magnet.

These brakes are characterized by the quickness of their operation. They respond almost instantly, "releasing" when the power is applied and "setting" when the power is cut off. This is due to the design of the



Triple-Pole "Safety First" Lever Switch.



New Westinghouse Magnetic Brake Applied to Motor Shaft of an Electric Hoist.

operating magnet which gives high initial pull and a very small distance of travel (¼ inch to 1 inch).

Their operation is similar. When voltage is impressed on the motor the magnet is energized and the magnet armature lever overcomes the pressure of the compression springs through a toggle and releases the brake-shoe grip upon the brake wheel. While the magnet remains energized the brake wheel is allowed to rotate freely. As soon as the current is shut off from the motor the brake magnet releases and the compression springs force the shoes against the brake wheel

General View of the New Westinghouse Magnetic Brake.

and bring the motor quickly and smoothly to rest without shock or jar. The compression exerted by the springs can be easily adjusted so that any holding or retarding torque up to the full capacity of the brake can be obtained for equal braking effort for both directions of rotation. Simple means for making adjustment for shoe wear are provided.

In case adjustments for shoe wear should be neglected, a safety feature has been introduced so that the brake does not fail to hold the load but the magnet will not release the grip on the brake wheel. This insures proper brake operation and the elimination of accidents due to the slippage of the brake wheel.

The simplicity and accessibility of the few parts of these brakes are shown in the accompanying illustrations.

Packard Bell-Ringing Transformer Improved.

An improved bell-ringing transformer is announced by the Packard Electric Company, Warren, Ohio. The new appliance is of the same electrical construction as the former "Packard Belle" transformer but several improvements have been made in the design of the case. The former type had a brass-bolted two-piece case with lugs projecting from the top and two lower sides and these have been eliminated by making the heavy porcelain case in one piece. This results in a neater, more compact device, the only projecting parts being the bell-wire binding posts and two small slotted flanges on the base to receive the screws by which the transformer is secured in place.

The electrical element is inserted in the case through an opening in the base and then completely covered with a fine grade of sealing compound, thus forming the unit into practically one solid piece. The leads are marked in raised letters on the adjacent porcelain, thus insuring against any possible mistake in making connections.

The new transformer is so made that a dead short circuit on the secondary or bell side for an indefinite length of time will pull less than 15 watts from the 110-volt service wires. The cases are finished in blue with a high glaze which renders the unit attractive to the eye and assists materially in making sales.

1917 DEVELOPMENTS OF THE CUTLER-HAMMER MANUFACTURING COMPANY.

Many New and Improved Devices Brought Out in Switches, Controllers, Magnetic, Heating and Battery-Charging Equipment.

During the year 1917 the various departments of The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., have developed numerous new products and appliances, some of which are mentioned in the following.

Switches and Wiring Specialties.

In the Switch and Specialty Department some of the principal new devices are:

The six-ampere pull switch, which is made in ceiling, fixture and pendent types.

Single and duplex flush receptacles, the duplex type being of the same size to fit the outlet box originally occupied by the single receptacle. This device, therefore, furnishes two outlets for the space formerly required for one.

New cord connectors and motor attachment plugs have been developed to the standard adopted by six leading manufacturers who make standard attaching devices interchangeable.

To this same line have also been added surface receptacles and porcelain current taps with standard parallel blades.

The C-H 7050 switch for cord attachment is probably the most widely known device of the specialty line, since this switch has been nationally advertised and put up in colored display cartons. This switch is for use with electric irons, toasters, and other portable or table appliances. The switch is very easily attached to the cord.

A new remote-control switch for lighting service, made in single, double, and triple-pole types, has also been added. In the manufacture of this switch the standard cold-rolled fingers with copper contacts, which are used in the rugged C-H drum-type motor controllers, are employed.

Controllers and Control Devices.

In the Controller Department there have been many additional developments, reference to a few of which may be made as follows:

A phase-failure and phase-reversal protective device is one of the new relays for providing protection to alternating-current motors against phase failure, phase reversal, and drop in supply voltage.

A new double-pole pressure regulator has been standardized, which may be used for the direct starting and stopping of small direct-current and alternating-current motors used for pump and compressor drive.

In the line of machine-tool controllers three automatic classes have been developed which are referred to as "plain starting," "speed setting" and "speed regulating."

Plain starting controllers are for use with machines driven by constant-speed motors on which the necessary speeds are obtained by speed-changing gears. Starting, stopping and (if desired) reversing of the motor are accomplished automatically.

Speed-setting controllers provide means for automatically starting the motor, and the field rheostat, which is a part of this controller, is used to provide various running speeds. The field rheostat can be adjusted to give the speeds required for different jobs. Regardless of the number of stops made, the motor

(adjustable-speed type) will always be automatically brought up to the speed for which the field rheostat is set until further adjustment is made. These controllers are particularly suitable where speed changes are not made frequently and where it is desirable to set a speed for a given piece of work, such as boring mills, milling machines, etc.

Speed-regulating controllers give the operator complete, accurate and easy control of the starting, stopping, speed regulation and reversing from one point. The automatic panel is usually mounted up out of the way and a control handwheel placed conveniently for the operator to make frequent speed changes, with accurate and ready control. Controllers of this type relieve the workman of all extra responsibilities, allowing him to concentrate on the work for which he is employed.

The simple Cutler-Hammer magnetic lockout switches are used for the automatic acceleration of all C-H machine-tool controllers. These switches eliminate the use of all interlocking contacts and circuits, series relays, protective resistance, etc., making an extremely simple and rugged construction. These controllers all provide graduated dynamic braking and have positive no-voltage release.

A new direct-current controller for providing a speed range of 3 to 1 and which may be operated by handle or sprocket wheel is one of the newer controllers put into standard service. By means of the sprocket-chain drive the control can be located at a convenient point as, for instance, on the apron of the lathe.

A planer controller has also been developed and put in considerable use, particularly in some of the large munition plants.

New semi-automatic motor starters of the inclosed type have been developed, one designed for use with direct-current motors of the usual voltages up to 500, and the other for use with alternating-current motors of the squirrel-cage and slip-ring polyphase types. These starters are intended for use with motors employed for such service that manual control of starting and stopping is satisfactory but where it is desirable that the rate of acceleration be independent of the operator.

The starting movement of these semi-automatic controllers is of the multiple-contact type and is operated by means of a handle or lever outside of the inclosing case. To start the motor the lever is raised to the "up" position and held there. In this position the starting resistance is in series with the motor. When the handle is released the starting resistance is cut out of the circuit by the gravity-actuated accelerating movement which is under the control of an air dashpot. The time of acceleration may be varied by changing the adjustment of the air inlet of this dashpot.

New inclosed drum-type controllers of the manually operated types for the starting and speed regulation of single-phase and polyphase motors have been standardized. The contact fingers of these controllers are so mounted that they may be removed entirely by swinging out the arc shield and removing two bolts.

Of the smaller types of motor starters the new No. 9116 is of the completely inclosed type. This safety switch is for use with squirrel-cage motors and provides a low-voltage and overload protection. The operating handle is outside the inclosing case so that the workman need not come in contact, by any chance, with live parts of the electrical circuit. To inspect or renew the fuses which are located in the upper portion of the case, a small sliding panel is lowered which is so interlocked that it cuts the circuit and the operating handle cannot be moved to the "on" position when this panel is lowered.

New brakes for both direct-current and alternating-current service have been developed. The former brake is of the motor-operated shoe type made in six standard sizes up to 250 horsepower. The alternating-current brake is similar but is operated by a high-torque squirrel-cage motor. These brakes are particularly adapted for severe duty.

To the theater-dimmer line a new portable dimmer has been added, and the use of the double-set standard plate extended. This two-sided dimmer plate is practically the same as two separate dimmer plates, and reduces the amount of space required by about one-half.

Magnetic Clutches and Lifting Magnets.

C-H magnetic clutches have been made in more sizes during the past year, smaller as well as larger ones having been added to the line. The largest magnetic clutch, which has a diameter of 78 inches with a capacity of 2200 horsepower at 100 revolutions per minute, is installed on a rubber mill drive of the Goodyear Rubber Company, Akron, Ohio.

In the rubber mills the C-H magnetic separator has also been put to work removing small pieces of steel wire which wear off the buffing wheels used in finishing the rubber tires. These little pieces become mixed with the rubber and if not removed prevent the use of this rubber again.

The use of lifting magnets has again been extended to underwater service. Early in the year a cargo of pig iron worth about $10,000 sank in the Tennessee River. A Cutler-Hammer magnet of the standard type was used and 95 per cent of the cargo recovered.

Electric Heating Devices.

A new electric soldering iron has been added to the industrial heating line which has the electric soldering unit hermetically sealed inside the body of the iron. This is done to prevent moisture, heated solder, or flux from penetrating and coming in contact with the heater wire. The copper tip of the C-H soldering iron is secured to the body over a threaded extension of the iron body itself. The heat thus passes the body into the core extension and then into the working tip.

The use of electric linotype pots has been extended, this being particularly brought about by the economy of electrically heated pots, as well as by the restrictions of the health departments in some cities in eliminating the use of gas-heated type pots.

The C-H space heater, which is a steel-jacketed unit and looks like a two-foot rule, has been put to many new uses besides that of crane-cab heating during the past year. It has been installed in theater ticket booths, watch and signal towers, turntable cabs, etc.

A new electric portable radiator, and a hot plate have been added to the domestic line.

Battery-Charging Equipment.

Battery-charging equipments for electric industrial vehicles and electric industrial trucks have been extended to include constant-potential boards as well as constant-current panels.

For the charging of miners' electric lamps new unit-type charging racks have been developed which provide an easily augmented control for taking care of few or many storage-battery lamps.

The C-H magnetic shift has been in successful operation during the year, the equipment on the Premier car being particularly noteworthy.

Trade Activities

Larger Quarters By Manufacturers Being Opened—Calendars and Catalogs Being Distributed—Other Activities

Universal Motor Company, Oshkosh, Wis., is sending out an attractive calendar for 1918. The harmonious colors of tan and brown are effectively combined in the color scheme, which combination is also carried out in the oval water scene. Two types of Universal machines are illustrated—a marine motor and a generating set.

The Esterline Company, Indianapolis, Ind., announces the appointment of J. S. Pandiani, via Mario Pagano 27, Milano, Italy, as its trade representative in that country. Until recently Mr. Pandiani was manager of the meter and supply department of the Italian Westinghouse Company, and in the future will give his attention to the sale of Esterline instruments and permanent magnets throughout Italy.

Rutenber Electric Company, Marion, Ind., has distributed the third edition of its new catalog of electric cooking and heating appliances. It is a 28-page book. Some ten models of electric ranges, as well as several hot plates, portable ovens, toasters, grills, radiators and flatirons are described and illustrated. The details of construction and operation of Rutenber ranges are explained in much detail.

Youngstown Sheet & Tube Company, Youngstown, Ohio, is sending out a unique 1918 calendar. For the purpose of reducing the consumption of paper stock, along the lines of conservation of material, this calendar has been printed on six sheets, instead of twelve. At the end of each month the sheets may simply be turned back and when the sixth month has expired, the calendar can be reversed. The illustrations heading each month, showing operations in handling steel, etc., are effectively reproduced in natural colors, giving a very realistic touch.

Sorgel Electric Company, 138 West Water Street, Milwaukee, Wis., which deals in electrical machinery, repairs and supplies, buying, selling, exchanging, renting and repairing motors and generators, in addition thereto operates an up-to-date repair shop, where it is equipped to rewind or make any other repairs to any make, size or type of electrical machinery. The company carries a complete stock of such supplies and repairs as are required in the maintenance of repairing of motors and generators.

Bates Expanded Steel Truss Company, 208 South La Salle street, Chicago, has issued a valuable and useful 1918 edition of "Bates Steel Pole Treatise." This treatise is presented as a veritable encyclopedia of modern steel pole art and is replete with various valuable data and simple formula. Descriptive illustrations and diagrams are given on the manufacture of the company's one-piece steel poles and accessories, together with capacities, installations, pole fixtures and fittings, tests, adaptability, prices, wire data, etc. Several pages list names and addresses of users of Bates' steel poles, which lists include names in practically every state in the Union, besides users in Brazil, Canada, Cuba, France, Hawaiian Islands, India, Italy, South Africa, South America and Sweden.

The Electric Furnace Company, Alliance, Ohio, is distributing an attractive bulletin on its Baily automatic electric furnaces for the heat treatment of high explosive and shrapnel shells. This bulletin shows several good illustrations, with descriptions of modifications that have been made to adapt automatic electric furnaces for shell work, and it is claimed they represent the highest development for rapid and exact practice in the work. The company also builds the Automatic control type continuous furnace for heat-treating steel castings and forgings, the Car type for annealing aluminum, brass, copper and steel, the Continuous and Hearth type for carbonizing, the Pit furnace for melting copper and precious metals and for soaking ingots, the Pusher type continuous furnace for heating and annealing aluminum, brass, copper and steel, and the Tilting furnace, hearth type, for melting aluminum, brass, bronze, copper and soft metals.

De La Vergne Machine Company, with principal office and works at 1219 East 138th Street, New York City, is sending out an attractive 1918 calendar for factory, shop or office use, showing 17 fine illustrations of De La Vergne products. Under each illustration a brief description of the machinery shown is given, also the name and location of plant where installed.

Paul Stewart & Company, Cincinnati, O., dealers in electrical and steam machinery, call attention to an engine and direct-current generator unit which is offered for immediate shipment. It comprises a General Electric 800-kilowatt direct-current engine type generator, 250-270-volt, direct-connected to an American-Wheelock, horizontal, cross-compound condensing engine, with 18 and 48 by 48 inch cylinders; all complete with switchboard, air pump, and jet condenser.

The Vilter Manufacturing Company, with main office and works at Milwaukee, Wis., and sales offices in the principal cities of the United States, is sending out a catalog on its Corliss steam engines and refrigerating machinery. This catalog shows some clearly defined illustrations, with brief and comprehensive descriptions of machinery and accessories and tables on operation of same. A separate bulletin, No. 25, which the company is also distributing, deals with improved medium-speed poppet valve engines for refrigerating machines and general power purposes. The illustrations in this are more fully described.

The Gray Electric Company, Springfield, Ohio, recently moved to new quarters at 36 North Fountain Avenue, in which there is ample floor space for the larger stock of electrical supplies being carried. This company makes a specialty of the Ruralite farm-lighting unit, which it manufactures. This consists of a switchboard and generator unit of different capacities, ranging from ½ to 2 kilowatts, built for belt connection to a gasoline engine. Besides being sold locally by the company in Springfield, these units are widely sold through dealers. During 1917 about 1200 were sold.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has just issued a number of new leaflets, illustrating and describing new lines added to its extensive list of manufactures. A supplemental page, No. 3, to catalog 7-A, shows its CI Luxsolite fixtures in the different types. Tables are also given for use of these fixtures with or without auto-transformers and with or without sockets. Prices for each fixture complete are listed. Leaflet L-2000 illustrates and describes Westinghouse 10-kilowatt direct-current turbine-generator, giving specification. Leaflet L. 3555-A deals with Westinghouse self-contained vertical shaft alternating-current generators, with descriptions, diagrams and several illustrations of installations. Leaflet 3910 shows various types of Westinghouse motor equipment for textile service, with brief descriptions. Leaflet 3986 touches on the present important and vital question of boiler-room economies and tells of the efficiency, capacity and flexibility of the Westinghouse underfeed stokers. Diagrams of test performances are given. A bulletin dated November, 1917, containing railway engineering data, gives descriptions and diagrams on selection and application of car equipments, embodying reversing, electric braking, protection, etc. Along with this is a separate bulletin, entitled "Problems Confronting the Electric Railway Industry," with articles by Van Horn Ely, president of the American Railways Company, Calvert Townley, T. P. Gaylord and W. S. Rugg, who are assistant to president, acting vice-president and manager of railway department, respectively, of the Westinghouse company, and W. G. Brooks, of the Chicago district office. This bulletin is reprint No. 65 from The Electric Journal and is dated October, 1917. It contains much valuable information on the subjects it deals with.

The William A. Carroa Electric Company, a Missouri corporation, has been qualified to do business in Indiana, in the installation of electrical apparatus. C. E. Crowley, of East Chicago, Ind., is named as agent for the company.

Harvey Hubbell, Inc., Bridgeport, Conn., in bulletin No. 16-2, illustrates and describes its new toggle snap switches of the surface type. This is a very neat and conveniently operated switch, made in both single-pole and three-way types.

American Lighting Company, originator and manufacturer of the Davis system of flood-light projectors for industrial, railroad and miscellaneous flood-lighting service, has removed from 1422 West Randolph street to the corner of Polk and Sibley streets, Chicago, Ill.

Play-O-Lite Company, Inc., Buffalo, N. Y., has prepared a folder illustrating and describing its Play-O-Lite piano lamp. This is a very compact and quickly applied device that will fit any make of upright or player piano. It is finished in both standard wood and metal finishes.

The Trumbull Electric Manufacturing Company, Plainville, Conn., is distributing circular No. 23 on its Circle T type "C" switches, of which the entire line is shown in its catalog No. 11. These are made in ratings 30 to 200 amperes, fused and unfused, all styles, 250-600 volt direct current and 250-500 volt alternating current.

Driver-Harris Company, Harrison, N. J., manufacturer of wire, has distributed a bonus fund of $16,000 among its employees. Those employed at the plant for six months have received five per cent, and six per cent was given to those employed for a year, the rate continuing until a maximum of $250 was reached. In addition to the bonus each employee associated with the company for the last six months was given a life insurance policy for $500.

Harvey Hubbell, Inc., Bridgeport, Conn., has sent out leaflets describing the Hubbell quick-catch sockets. These are made in the key, keyless and pull types, both for fixtures, pendent and other uses. The leaflet illustrates the details of construction of these different types and also shows a few of the combinations, which can readily be made by interchanging the shells with various caps and bases.

Benjamin Company Holds Sales Conference.—The annual sales conference, Central Division, of the Benjamin Electric Manufacturing Company, Chicago, Ill., was held from December 27, 1917 to January 2, 1918, inclusive. The sessions were formal, and the Benjamin material was considered by groups; sales policies and methods were outlined and decided upon for the year 1918. W. D. Steele, vice-president, addressed the conference on the subject of the future of the Benjamin Company, and R. B. Benjamin, president, gave a very interesting talk on new devices on which he is working, and which the Benjamin Company expects to announce to the trade in the near future.

Rauch & Lang Company, Cleveland, Ohio, recently received an order for 46 electrics for shipment to Norway, through a Norwegian automobile agent. It is stated that no stipulation as to delivery was made, but that the purchaser will be glad to get the cars at any time and in any quantity. Rauch & Lang Company has agreed to have the entire order at the docks ready for transportation to Norway as rapidly as the cars can be produced. W. G. Pancoast, manager for the company's Chicago business and for the Owen Magnetic car agency, reports a splendid business recently, stating that all the cars he sold were not ordered as Christmas gifts either, but that women have come to regard the electric as a domestic necessity.

Link-Belt Company's illustrated book, No. 299, deals specially with Link-Belt silent-chain transmission in rubber mills. The severe conditions imposed on the drive between the motor and the machine in such mills have directed the attention of engineers to this part of the equipment as a means of maintaining efficiency. Among the claims set forth favorable to this company's silent chain drive are flexibility, positiveness and durability. In high-speed rubber mill machines which are subject to severe shocks and over-loads, the flexibility of the silent chain drive is sufficient to cushion the shocks and absorb the overload. These phases of adaptability and durability make for efficiency and economy. The rubber-mill machinery comprises cookers, calenders, washers, presses and trimmers. Attention is also called to the adaptability of Link-Belt silent-chain transmission in cement plants, paper mills, grain elevators and textile mills. The book contains numerous illustrations showing this form of silent chain drive in plants of the classes mentioned. They are all instructive as portraying the many types of installations in which this kind of transmission figures.

Spencer Turbine Cleaner Company, Hartford, Conn., has been awarded a contract for the installation of a vacuum cleaner system, consisting of a central plant in the basement, with piping extensions to several hundred stations, in the Hotel Commonwealth, New York, which is to be one of the largest hotels in the world.

National Engineering & Equipment Company, L. C. Smith Building, Seattle, Wash., has been awarded a contract for constructing three electric ovens for the American Nitrogen Products Company at La Grande, Wash., to cost about $5000.

The United States Graphite Company, with general offices and factory at Saginaw, Mich., mines in Sonora, Mexico, and branch offices in the principal cities of the United States and in London, England, Berlin and Fuerth, Germany, is sending out a booklet, which in simplified form gives convincing evidence of the universal success of its Mexican boiler graphite as a remedy for scale in boilers. The purpose of its lubricating graphite and Mexican graphite cup grease are also described. Numerous letters from users in almost every state in the Union are printed in the booklet and all praise the company's product, telling of their success with same.

The De Vry Corporation, 117 North Fifth Avenue, Chicago, Ill., is mailing a well illustrated catalog on its De Vry portable projector and accessories, as applied to sales and advertising, education, entertainment and the home. The educational scope of motion pictures, which is unquestioned, is made possible with the use of these projectors in schools, Sunday schools, churches, colleges, universities, theaters, etc., and is a great assistant in medical work in illustrating latest achievements in surgery and therapeutics. The machine is simple to operate, portable, weighing 20 pounds and has a capacity up to 1000 feet regulation size reels and film, making possible an unlimited supply of subjects for every purpose—educational, entertainment, industrial or the home. About 50 names and addresses as some of the users of De Vry projectors are listed, including the General Electric Company, B. F. Goodrich Tire & Rubber Company, Goodyear Tire & Rubber Company, National Lamp Works, Western Electric Company, Westinghouse Electric & Manufacturing Company, and many others.

Inland Electric Company, 14 North Franklin street, Chicago, is distributing an illustrated circular from its Steelite Department, to the electrical jobbing trade on Steelite extension fixtures. An actual reproduction of a double-page advertisement on this unit tells of the mission of the Steelite extension fixtures. They replace dangerous extension light cords, save cost of constant repairs, reduce fire risks, as one fire prevented will save enough money to equip a dozen plants, and they prevent injuries to men. They are safe and wearproof, requiring no renewals, and tying, twisting, meshing and kinking will not tangle them. The severest test will not crush them. These fixtures are National Electrical Code Standards and are fully approved by the National Board of Fire Underwriters. To prove their merits the company will send, on request, a complete unit for a 30-day free trial test. The object is to supply the user through wholesalers and local dealers, and the aim is to direct the trade to local supply dealers. Descriptive circulars, price lists and discount sheets will be furnished by the company upon request.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., in a catalog of industrial apparatus, just issued, No. 8-E, has grouped all of the industrial electric heating apparatus which it manufactures. The line includes steel-clad heaters for many industrial processes, immersion-type water heaters, stoves of various forms, chocolate warmers, tailors' irons and electric-oven heaters for use in enameling. Data are given for the calculation of the proper amount of heating to provide for water and for the heating of buildings. Several pages are devoted to the subject of electrically heated ovens, covering the design and construction of the ovens themselves, a discussion of the various types and their uses, and the efficiencies in operation which can be secured. Westinghouse electrical heaters, which are of the ribbon type, are described, and also the company's system of thermostatic control. A considerable number of circuit diagrams are given, showing various methods of applying these control devices. Enclosed with the catalog is a data blank showing the information which should be furnished by any user of electrically heated ovens in order to enable the company to arrive at the proper number and type of heaters for his service. This catalog is a valuable addition to the library of any man whose work includes the application of heat at moderate temperatures for industrial purposes.

Latest Approved Fittings

The electrical fittings listed and described in this department have been approved by the Underwriters' Laboratories, Incorporated, after examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

Heaters, Air.—Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.
"Westinghouse." Type D, non-luminous, 1000-3000 watts, 100-250 volts.
Listed December 2, 1917.

Heaters—Pressing Irons.—Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.
"Westinghouse Cinderella." 100-250 volts, 550 watts, 6½ pounds.
Laundry iron. Type F. 100-125 volts, 250 watts, 3 pounds.
Laundry iron. Type E. 100-250 volts, 550 watts, 6 pounds; 635 watts, 8 pounds.
Listed December 1, 1917.

Receptacles, Medium-Base.—Pass & Seymour, Inc., Solvay, (Syracuse), N. Y.
"P. & S." porcelain shell. Keyless, catalog No. 4035.
Listed November 20, 1917.

Socket Linings. — The Pairpoint Corporation, New Bedford, Mass.
"Diamond P." Linings for sockets and receptacles.
Listed November 6, 1917.

Sockets, Medium-Base. — Arrow Electric Company, Hartford, Conn.
"Arrow E" metal shell.
Pull, catalog Nos. D-4, D-5, D-6, D-8, D-12 (4502), E-1 to E-18 inclusive, FD-207 (8512), FD-209 (8530), FD-211 (8531), FD-217 (8503), FE-201 to FE-218 inclusive, FI-201 to FI-218 inclusive, FJ-201 to FJ-218 inclusive, I-1 to I-18 inclusive, J-1 to J-18 inclusive. Electrolier, catalog Nos. EE-801 to EE-816 inclusive, EI-801 to EI-816 inclusive, EJ-901 to EJ-816 inclusive.
Push-button, 660 watts, 250 volts. Electrolier, catalog Nos. CD-801 to CD-816 inclusive, CF-801 to CF-816 inclusive.
Also above types with shadeholders attached, also above types with lamp grip.
Listed November 15, 1917.

Sockets, Medium-Base. — Bryant Electric Company, Bridgeport, Conn.
"Bryant" or "Perkins" metal shell.
Pull, electrolier, catalog No. 4121 when installed with casing.
Listed October 22, 1917.

Sockets, Medium-Base.—General Electric Company, Schenectady, N. Y.
"G. E." metal shell.
Pull, catalog Nos. GE946, GE948-51 inclusive.
Listed October 15, 1917.

Sockets, Mogul-Base.—Arrow Electric Company, Hartford, Conn.
"Arrow E" metal shell.
Keyless, 1500 watts, 600 volts, catalog Nos. 5000-01.
Also above types with shadeholders attached.
Porcelain shell.
Keyless, 1500 watts, 600 volts, catalog Nos. MA-380 (5064), MB-303 (5045), MB-304 (5046), MB-353 (5098), MB-354 (5099), MB-363 (5100), MB-380 (5050), MB-403 (5055), MB-404 (5056), MB-463 (5057), ME-303, ME-304, ME-380, ME-403, ME-404, ME-463.
Weatherproof, porcelain shell.
Keyless, 1500 watts, 600 volts, catalog Nos. MC-303 (5049), MC-304 (5123), MC-380 (5125), MC-403 (5127), MC-404 (5129), MC-463 (5131), MD-303 (5078), MD-304 (5079), MD-380 (5083).
Also above types with lamp grip.
Listed November 20, 1917.

Switches, Inclosed.—Detroit Fuse & Manufacturing Company, Detroit, Mich.
"Square D." Two-pole knife switches and cutout bases for standard plug or cartridge inclosed fuses. Inclosed in metal case and designed for manual operation without opening cases.
0-200 amperes, all standard voltages. Catalog Nos. 52,242-43, 52,251, 52,342-43, 52,351, 56,211, 56,311, 56,411, 56,251, 56,351, 56,451.
Listed October 24, 1917.

Switches, Inclosed.—Globe Electric Works, 1959 Mission Street, San Francisco, Cal.
A standard fused switch mounted in a sheet-metal cutout box and provided with a handle for manual operation without opening case.
Listed October 26, 1917.

Switches, Inclosed.—The Trumbull Electric Manufacturing Company, Plainville, Conn.
Two, three and four-pole knife switches and cutout bases for standard plug and cartridge fuses, inclosed in metal cases and designed for manual operation without opening cases.
"Circle T," 30 and 60 amperes, 250 and 500 volts, alternating current, catalog Nos. 13,600-09 inclusive.
Listed October 8, 1917.

Switches, Inclosed. — Wadsworth Electric Manufacturing Company, 405 Madison Avenue, Covington, Ky.
Standard two or three-pole knife switch and standard cutout base inclosed in metal case and designed for manual operation without opening case. No "live" parts exposed in inspecting or changing fuses.
"Compro." 0-30 amperes, 125-250 volts, catalog No. 2449.
Listed November 9, 1917.

Switches and Fuses, Combination Snap.—The Bryant Electric Company, Bridgeport, Conn.
"Bryant" or "Perkins."
Double-pole snap switches combined with cartridge-type fuse bases. 10 amperes, 250 volts, catalog Nos. 2684-89 inclusive.
Listed October 22, 1917.

Switches, Pendent.—Bryant Electric Company, Bridgeport, Conn.
"Bryant" or "Perkins." Single-pole. Push, catalog Nos. 2572-M, 2572-N, 2592-M, 2592-N.
Listed October 22, 1917.

Switches, Pendent. — The Arrow Electric Company, Hartford, Conn.
Adaptations of standard "Arrow E" pull-socket mechanisms.
"Arrow E." Single-pole, 1 ampere, 250 volts, 3 amperes, 125 volts, catalog Nos. FK-218, FL-218, FM-218, FN-217, FN-218, FO-217, FO-218, FP-217, FP-218, K-18, L-18, M-18, N-17, N-18, O-17, O-18, P-17, P-18.
Also above types with extension attachment.
Listed November 30, 1917.

Switches, Push and Rotary Flush.—The Arrow Electric Company, Hartford, Conn.
"Arrow E."
Two-circuit, catalog Nos. 6256B, 6256C, 6256D, 6528-30 inclusive.
Three-circuit, catalog Nos. 6257G, 6525-27 inclusive.
Duplex switches, combination of two single-pole, catalog No. 6516; combination of one single-pole and one two-circuit, catalog Nos. 6517-20 inclusive, 6540.
Also above switches in lock type.
Panelboard adapter, catalog No. 1900.
Listed November 24, 1917.

Switches, Surface.—General Electric Company, Schenectady, N. Y.
"G. E." Single-pole, catalog No. 198,632.
Listed October 29, 1917.

Transformers, Bell-Ringing.—Western Electric Company, Inc., 195 Broadway, New York, N. Y.
Air-cooled transformers designed to supply current at following voltages; for use only in ringing bells or for similar signaling work, when primary wiring is installed in accordance with Class C rules, National Electrical Code.
60 cycles. Primary 110 volts; secondary 6, 8, 14 volts, "Western Electric No. 1."
Listed October 29, 1917.

Tubing, Flexible.—Short Electric Manufacturing Corporation, Penn Yan, N. Y.
Marking.—Red thread running longitudinally.
Listed October 23, 1917.

Tubing, Flexible, Fasteners.—W. P. Hyatt Electric Works, 2806 Thirty-fifth Street, Sacramento, Cal.
"Perfection." For securing flexible tubing in outlets.
Listed October 26, 1917.

Men in Service

Commonwealth-Edison's Service Club—B. J. Arnold Promoted—C. R. Underhill Promoted—Ilg Electric's Work

A. W. K. Billings, consulting engineer, who was located at Hotel Margaret, 97 Columbia Heights, Brooklyn, N. Y., is now lieutenant-commander in foreign service and may be addressed in care Commander U. S. Naval Aviation Forces, Paris, France.

W. R. Thompson, formerly captain of the 109th Regiment of Engineers, stationed at Camp Cody, Deming, N. M., has been made major in the same regiment. In civil life Major Thompson was manager of engineering and construction for H. M. Byllesby & Company, and won recognition for valuable work in construction and engineering performed at and near Camp Cody.

Robert B. Owens, secretary of the Franklin Institute of Philadelphia, and widely known in electrical engineering circles, who was commissioned a captain in the United States Signal Corps a few months ago, has been promoted to the rank of major, and is now with General Pershing at the front.

Eleven Jovians, members of the Jovian Electric League of Kansas City, are now in the service of their country, and on December 21, a service flag with 11 stars, was presented to the League by E. L. Foutch, of the B-R Electric Company. This was the regular December meeting, attended by 60 members and visitors; the chief speaker was Capt. R. W. Simmie, M. C., now recruiting officer for British forces in Kansas City, who told of experiences at the front in Europe. Among the guests present were Major Norton and Lieutenant Robinson of the Engineers' Corps, Fort Leavenworth.

Commonwealth Edison Company, Chicago, Ill., through its Advisory Committee, has formed a special committee that will organize an Edison Soldiers' and Sailors' Club for the purpose of lending comfort and cheer to its boys in the service of their country. The chairman of the new committee is E. W. Lloyd, general contract agent, and the members are W. L. Abbott, chief operating engineer, and R. F. Schuchardt, electrical engineer. This club proposes to send to the men such articles of clothing, food and camp luxuries as are not afforded by the Government Commissary Department and also to maintain regular means of communication between the men and the individuals in the company. Plans are being considered that will probably include the organization of one committee in each department and sub-department of the company to collect from employes of that department small semi-monthly dues which will probably not exceed 25 cents a month. This club, after it has been formed, will co-operate with Electra, C. E. Section of the N. E. L. A., and various other organizations throughout the company which have been doing work of this kind.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

The Electrical Review *will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

Bion J. Arnold, the noted electrical engineer and traction expert, has been commissioned a lieutenant colonel and will leave soon for active service with General Pershing's army in France.

Bion J. Arnold.

Lieut.-Col. Arnold has received special instructions from the chief of the Signal Corps and, it is understood, will take charge of an important undertaking in connection with the American aviation service at the front. Mr. Arnold's reputation as an engineer in civil life extends not only to all parts of the country but even abroad, his best known work being in connection with expert studies of street railways and rapid-transit systems in probably over a score of cities. Since its creation in 1907, he has been chairman and chief engineer of the Board of Supervising Engineers, Chicago Traction. He is head of The Arnold Company, Chicago, one of the largest engineering and constructing firms in the country, which has had an extensive practice in the design and construction of extensive railroad shops, railroad electrification, power houses, and other engineering works. He is a past president of the American Institute of Electrical Engineers, and of the Western Society of Engineers. It is not so generally known that Lieut.-Col. Arnold has been keenly interested in aviation for some 25 years. He was associated with the late Octave Chanute, one of the pioneers in the studies of aerial flight and himself a noted engineer. For many years the Arnold aviation hobby has proven of great assistance to various aero clubs and now it has been found to be of national service.

Guy A. Richardson, superintendent of railways for Puget Sound Traction, Light & Power Company, Seattle, Wash., is now in Philadelphia, to assist for a time the International Mercantile Corporation in solving the problems of transportation to and from its plant at that place, where many thousand men are employed in constructing steel ships for the United States. Charles A. Stone, of the Stone & Webster Corporation, is president of the International Mercantile Corporation.

Interborough Rapid Transit Company and related companies, with headquarters 165 Broadway, New York City, has a service flag with 1260 stars, representing that many employees of the companies in active service under the colors of Uncle Sam. To back up these men in service employees subscribed $4,000,000 for the second Liberty Loan. Exactly 7769 employees voluntarily subscribed $733,200 for bonds. The Interborough's contribution to the Red Cross amounted to $14,961.

Charles R. Underhill, chief electrical engineer for the Acme Wire Company, New Haven, Conn., which manufactures field coils, solenoids, electro magnets and magnet wire, has been appointed captain of the Aviation Section, Signal Reserve Corps. For the last three years he has been giving a series of lectures on electrical phenomena as related to the design and construction of solenoids and magnets before practically all of the leading universities of the country which have a course in electricity and physics. His book on solenoids, electromagnets and electromagnetic windings is in its second edition, which has been thoroughly revised. Mr. Underhill, who is one of the best known men in the electrical industry, hoped to enter service at the beginning of the war, but suffered a nervous breakdown and was forced to leave business for some time.

Brig.-Gen. George H. Harries, a member of the H. M. Byllesby organization, who has been in charge of the 59th Depot Brigade, Camp Cody, Deming, N. M., has been transferred to Camp Jackson, Columbia, S. C., in command of the 186th Infantry Brigade.

H. H. Barter, engineer and technical director of the Triangle Film Corporation plant at Culver City, Cal., has accepted a call to one of the most responsible executive positions in the American International Shipbuilding Corporation, Philadelphia. The corporation is the active agent for the United States Shipping Board Emergency Fleet Corporation.

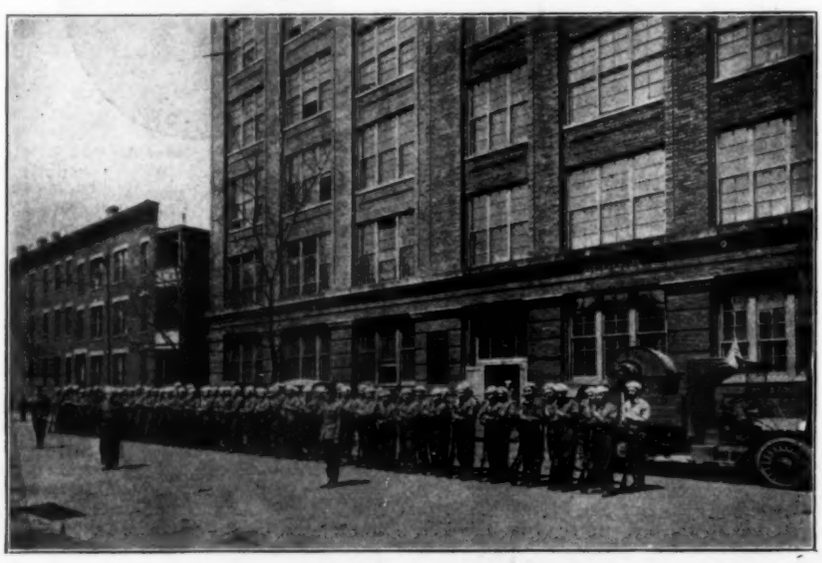
San Diego Consolidated Gas & Electric Company, San Diego, Cal., is displaying a large service flag from its building on Sixth Street, containing 51 blue stars, and more will be added soon. In accordance with custom, the company supplied San Diego's municipal Christmas tree, employees cutting it in the mountains and transporting it to the city.

New England Telephone & Telegraph Company and connecting companies honor its employees in service in an effective manner. An honor roll with every man's name in service occupies the wall facing the elevators on the first floor at 50 Oliver Street in Boston. There are 657 names upon it, representing men from all sections of the company's territory from Maine to Rhode Island. The roll is so arranged that additional names can and will be placed upon it as fast as employees enter military service. The American, British and French flags adorn the top of the roll, as it is with these forces that most of its men are serving. General Manager Driver is now considering a service flag to represent all employees in every section of the company's territory now in service. The flag will be on the headquarters building, 50 Oliver Street, Boston.

Northwestern Electrical Equipment Company, with offices in Duluth and St. Paul, Minn., in its January issue of the Northwestern Buzzer lists the names of its employees in military service as follows: Robert A. Bulmer, 9th Field Battalion, Signal Corps, Camp Samuel F. B. Morse, Tex.; Douglas A. Fell, Company C, 310th Field Signal Battalion, Enlisted Reserve Corps, Camp Custer, Battle Creek, Mich.; T. W. Fredericks, 25th Engineer Corps, Camp Devens, Ayers, Mass.; Donald Hough, Company B, 309th Field Signal Battalion, Camp Taylor, Louisville, Ky.; J. Johnson, Railway Engineer Corps; Harry P. Kanthack, electrician, U. S. Navy, Brooklyn, N. Y.; J. J. McFetridge, U. S. Aviation Training Camp, Texas State University, Austin, Tex.; George W. Miller, 1st lieutenant, Field Artillery, Camp Grant, Rockford, Ill.; D. R. Napier, Quartermaster's Department, Camp Dodge, Des Moines, Iowa; Obert Olson, 351st U. S. Infantry; D. T. Swift, Company L, 136th U. S. Infantry, Camp Cody, Deming, N. M.; E. S. Tallmadge, 2nd lieutenant, U. S. N. A., Headquarters, 313th Engineers, Camp Dodge, Des Moines, Iowa; K. B. Van Bergen, 2nd lieutenant, Field Artillery, Fort Riley, Kans. November 21 the company's service flag was draped in black for George C. Rosness, formerly a checker in the shipping department, who died on that date in the Brooklyn Navy Yard of pneumonia. He was only 23 years old and at the beginning of the war had volunteered his services to the Navy and was accepted in the electrical class. He was sent to the Brooklyn Navy Yard for training, where he contracted pneumonia, resulting in his sudden death.

Ilg Electric Ventilating Company, Whiting and Wells Streets, Chicago, through the Preparedness Day Parade in June, 1916, became convinced that in the present state of the world's affairs, the United States should be better prepared to protect its citizens, both at home and abroad. Upon sounding its employees as to their sentiment for preparedness they were unanimously for that movement and the showing and interest in the parade was so great that the officers of the company believe they have hit upon the proper solution of the preparedness problem—industrial establishments should train their men to protect their homes, their factories and their country. Every man in industrial life would then be a trained and equipped soldier, ready at any moment to answer his country's call. As the company numbered among its employees some old and experienced ex-officers, skilled in the training of troops, a battalion of infantry was organized and officered by the employees of the company. The company equipped this battalion in heavy marching order, ready for field duty and assigned a drill period during working hours. Every man gets paid full time while drilling and every man drills. The first Tuesday of each month is close-order drill, to the accompaniment of the company's own band; second Tuesday, company and squad movements; third Tuesday, extended order drill; fourth Tuesday, Butt's manual—the manual of the bayonet and combat exercises. When the weather does not permit outdoor drilling "Non-Com" school is the order of the day and the subject of instruction, including minor tactics, patrols, map reading and sketching, signaling, rules of land warwarfare and interior guard duty are taken up. On Saturdays instruction in small arm practice and rifle-range work is given. In summer on outdoor range and in winter on an indoor range. The Corporals of the squads are responsible for the conduct of their men, during working as well as drilling hours, and if a man does not report for work or is in trouble, his Corporal is notified, who then visits him, gives aid and comfort, with every man in the battalion backing him. The result of this experiment in practical patriotism and scientific management has been the growth of an *esprit-de-corps* such as is found in few organizations—public or private. No man ever quits and there is a long waiting list of men who wish to join this "happy family." The output of the company has increased and the cost of production gone down, so that it is enabled to give each man two weeks' vacation with pay each year, and pay the men a bonus, which this year will amount to not less than 16 per cent of his 1917 wages. And last, but not least, there is a trained and fully equipped body of loyal troops whose economic happiness has made them conservative and true, ready to do their duty.

Crane Company, 836 South Michigan Avenue, Chicago, with branch houses in 51 principal cities in the United States and warehouses and representatives in 10 cities, including a representative in Montreal, Quebec, has a total of 643 men on its Roll of Honor and since November 21 has added the following: From branch houses—S. A. Ressiguie and Newton Goodwin, Aberdeen; G. H. Wester, C. L. Anderson, J. Stublar and N. Andreen, Duluth; Percy Stone and Frank Stahl, Cincinnati; Charles T. Tenney, Oakland; James Dwyer, Philadelphia; W. L. Scholz, Spokane. From the clerical force—John T. Pick, Harry Stuart, C. J. Schipplock, George R. Clark, Herbert J. Wulf, W. J. Holland and Frank Szemaitis. From the industrial force—Fred Linehart, L. O. Gustafson, Peter Wolski, Tony Asko, Gabriel Fischer, Oscar Nelson, C. Karalkiewicz, Anthony Kujawa, John Lezanski, John Ivaniczko and Frank Hebda. In its January issue of The Valve World pictures of the following Crane boys in military service are shown: Sergt. John H. McCann, Quartermaster's Department; Pvt. L. C. Vanderlip, artillery; Pvt. Walter M. Samuels, artillery; Pvt. Sidney Sharf, infantry; Pvt. Roy T. Dixon, infantry; Pvt. Gilbert Johnson, Navy; Ensign Rd. Crane Gartz, Naval Flying Corps; First class petty officer, W. A. Dallack, Navy; Pvt. John Baer, artillery; Pvt. Edw. K. Chapin, Marine; Pvt. F. J. Simek, artillery. Stars are daily being added to the large flag flying from the third floor of the general offices, Crane Building, on South Michigan Avenue.



Ilg Electric Ventilating Company's "First Muster."

Personal

J. H. Smith Assistant Engineer Pennsylvania Public Service—Van Dusen Rickert Resigns—Other Changes

H. H. ROSEN will be superintendent of construction for the Main Electrical Engineering Construction Company, which will locate in Lorain, Ohio, in the early part of this month. Mr. Rosen formerly was with the Lorain Service Company.

H. H. HOXIE, sales manager of the Electric Railway Manufacturers & Supply Company, has resigned to become associated with the North Coast Electric Supply Company at Seattle, Wash., of which Harry Byrne is manager.

R. M. ALVORD, manager of the supply department of the General Electric Company at San Francisco, has been appointed chairman of the commercial section of the Pacific Coast Section of the National Electric Light Association, to succeed Stanley V. Walton, resigned.

E. L. MILLIKEN has been made general manager of the Houghton County Electric Light Company and Houghton County Traction Company at Houghton, Mich. Mr. Milliken formerly was manager of the Stone-Webster interests at Cape Breton, Nova Scotia. He assumed his new duties after the first of the year.

VAN DUSEN RICKERT severed his connections December 31 as assistant general manager and assistant secretary and treasurer of the Eastern Pennsylvania Railways Company and assistant general manager and secretary and treasurer of the Eastern Pennsylvania Light, Heat & Power Company, Pottsville, Pa. Early in October he announced his resignation from those positions, but at that time arranged to remain with the companies until a new general manager had been secured. Mr. Rickert is widely known in the utility field in Pennsylvania, having been with the Pottsville companies for many years. In 1910-1911 he was secretary-treasurer of the Pennsylvania Electric Association and three years later was president of that association.

JOHN HAYES SMITH, consulting engineer of Milwaukee, has closed his office to accept a position as assistant engineer to the Public Service Commission of Pennsylvania. Mr. Smith is a graduate of Cornell University, and associated himself with the Westinghouse Electric & Manufacturing Company shortly after graduation, remaining in their employ about six years. He is best known as the first manager of the Electrical Journal, Pittsburgh. Resigning this position, he became editor of the Electrical Age, New York, for four years. Since that time he has been in Milwaukee. For two years he was with the Milwaukee Electric Railway & Light Company, resigning as commercial engineer to take up consulting work. For the last four years he has been actively identified with much important work in Milwaukee, as well as engaged in rate and valuation work in other states.

FRANK E. PIERSON, Morristown, N. J., has been appointed city electrician for a period of one year.

STEPHEN W. BORDEN, Summit, N. J., has been reappointed city electrician for a period of one year.

PERCY W. ZEIGLER, Newport, Pa., has been appointed manager for the Cumberland Valley Telephone Company.

DAVIS H. TUCK, formerly assistant physician for the United States Public Health Service, has resigned to become commercial engineer for industrial and street lighting for the Holophane Glass Company, New York City.

J. D. MOONEY, sales manager of the Hyatt Roller Bearing Company, Newark, N. J., recently was appointed captain in the Ordnance Department, U. S., and is now stationed at Washington. He can be addressed there at 2503 Fourteenth Street N. W.

M. G. REES, an electrical engineer, connected with the Chicago office of the Westinghouse Electric & Manufacturing Company, has put in several months at Dayton, Ohio, supervising the installation of Westinghouse equipment in the new central station of Dayton Power & Light Company, now almost completed.

WILLIAM H. HODGE, publicity manager for H. M. Byllesby & Company at Chicago, is the author of a 16-page booklet, entitled "The Straight Road to Financial Independence." This booklet, which the company is distributing to 200,000 electric and gas customers, points out the difference between speculation and investment and describes the advantages of the preferred stocks of successful utility organizations.

FRANK J. FOLEY, manager of the mining section of the industrial department, Westinghouse Electric & Manufacturing Company, has accepted a position as manager of the mining and traction department of the Edison Storage Battery Company, located at Orange, N. J. Mr. Foley, who is a graduate of Pratt Institute, Brooklyn, has been with the Westinghouse company for 12 years, commencing with the service department in New York City and later being transferred to the industrial department at East Pittsburgh.

R. E. CHEW has been transferred to the United Gas & Electric Engineering Corporation's New York office, as an assistant in the rate and statistical department. For five years he was chief clerk in the office of the Colorado Springs Light, Heat & Power Company. For the last two and one-half years in Colorado Springs he gave particular attention to rate schedules and statistical work, which has fitted him well to assist the New York staff. He will filll the vacancy made by A. H. Ferrandou, who was appointed to war duty at Washington, D. C.

E. H. COLPITTS, E. B. CRAFT and W. F. HENDRY have been appointed assistant chief engineers of the Western Electric Company, at 195 Broadway, New York City.

A. R. TAYLOR, plant superintendent for the Lebanon Gas & Fuel Company, Lebanon, Pa., has resigned, due to ill health. He will be succeeded by J. E. Elson, of Denver, Colo.

S. E. SMITH, Reading, Pa., has been appointed general superintendent of the Reading Transit Company, with supervision over the entire system, comprising Lebanon, Norristown and Reading.

P. I. ROBINSON, who was superintendent of the Houghton County Electric Light Company, Houghton, Mich., recently was appointed to a similar position at Fort Madison, Iowa. No successor has been named to fill his place at Houghton, but L. H. Knapp is acting in the capacity for the time being.

W. F. CLAUSEN, Winona, Minn., who for more than five years has been the manager of the plant of Wisconsin-Minnesota Light & Power Company, retires from the position January 1, to engage in the coal business for himself at Fulton, Mo. He will be succeeded in the management of the Wisconsin-Minnesota company at Winona by G. W. Briggs, who goes there from Albion, Mich.

FRANK E. PAZDERA, who has held the position of electrician at the Kewaunee (Wis.) municipal electric light plant for the last six years, resigned December 20 to enter business for himself. He will open an electrical shop in the Pazdera Building, with a full line of electrical supplies and will also do electrical work, such as wiring and installing electric lighting systems, having the agency for some of the best lighting systems on the market.

EARL G. BURWELL has accepted a position as commercial manager of the Wyoming Electric Company, Casper, Wyo., having resigned his post with the Colorado Springs Light, Heat & Power Company. Prior to his association with the Colorado Springs office he was cashier of the Birmingham Railway, Light & Power Company. Frank Vogler, a member of the accounting department of the Colorado Springs Light, Heat & Power Company succeeds Mr. Burwell.

A. L. LINN, JR., recently was appointed treasurer of the United Gas & Electric Corporation and the United Gas & Electric Engineering Corporation. He succeeds H. J. Pritchard, resigned. Mr. Linn formerly was assistant to Horace E. Andrews, president of the New York State Railways and the Mohawk Valley Company, which control the electric railways in Rochester, Syracuse, Schenectady and Utica and the gas and electric utilities in Rochester and vicinity.

L. M. RUSSELL, city engineer of Elkhart, Ind., has resigned his position to become associated with Arthur I. Sweet, consulting engineer, Milwaukee, Wis.

W. B. FLANDERS of the Westinghouse Machine Company has been appointed engineer of marine turbines to have direction of the design of turbines for marine propulsion.

R. F. GOODING is now with the engineering department of the Philadelphia Electric Company, having left the switchboard engineering department of the Westinghouse Electric & Manufacturing Company.

E. M. WALKER has been made general manager of the Terre Haute, Indianapolis & Easter Traction Company, Terre Haute, Ind. He formerly was manager of the Dubuque Electric Company, Dubuque, Iowa.

L. F. HAMILTON, advertising manager of the National Tube Company, Pittsburgh, Pa., for the last nine years, has resigned to take up similar work with the Walworth Manufacturing Company, Boston, Mass. W. L. Schaeffer succeeds Mr. Hamilton.

MISS ELSIE EAVES, one of the engineering class of the University of Colorado, has been chosen president of the Combined Engineers, the organization of student engineers of that institution. This is the first time this honor has been conferred upon a young woman in the history of the university.

H. W. KING, superintendent of distribution for the East St. Louis Light & Power Company, East St. Louis, Ill., has resigned that position to become associated with the Sangamo Electric Company, Springfield, Ill. A farewell banquet was given him at the Planters Hotel in St. Louis by the St. Louis Electric Club, of which Mr. King is a director.

F. E. BOEKEN has been appointed superintendent of the San Francisco Municipal Railway to succeed Thomas A. Cashin, who died December 5. Mr. Boeken was formerly assistant superintendent of the railway and was advanced to acting superintendent to meet the emergency, which appointment later was made permanent. The Municipal Railway in San Francisco originally started by the electrification of the Geary street lines. Today feeders of the system traverse many sections of the populous residence districts of San Francisco.

R. N. EHRHART, for some years chief engineer of the condenser department of the Westinghouse Machine Company, has resigned to take up his duties as president and chief engineer of the Sedar Coal Company. He is still retained by the Westinghouse Machine Company as consulting engineer, and will open a consulting engineer's office in Pittsburgh, dealing with power plant equipment. Upon graduation from Cornell University he began work with the Westinghouse Machine Company as a technical apprentice in 1901, in the turbine department, serving in various capacities until 1908, when the condenser department was organized. During the period of this employment he was twice delegated to a special investigation and consulting work in Europe in connection with turbine and condenser apparatus of the foreign Westinghouse companies.

O. L. RULEY, formerly with the Union Traction Company, of Indiana, is now superintendent of the Portland municipal plant at Portland, Ind.

M. H. OWENS, formerly manager of the Hobart city plant at Hobart, Ind., has been appointed manager of the Inl ter-State Public Service Company for Columbus and Seymour, Ind.

K. E. N. COLE, who has been connected with the general offices of the Fort Smith Light & Traction Company, Fort Smith, Ark., has assumed the management of the Van Buren branch of the company.

GEORGE W. SCHMIDT, formerly chief engineer of the Dubuque Electric Company, Dubuque, Iowa, is now chief engineer of the Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute, Ind.

G. H. KELSAY, superintendent of power of the Union Traction Company of Indiana, of Anderson, Ind., has been made electrical engineer in charge of overhead lines, lighting and circuits and substations.

J. KENNEDY MANN has resigned as electrical engineer of the Wilkes-Barre Railway Company, of Wilkes-Barre, Pa., to assume the position of chief engineer with the Lackawanna & Wyoming Valley Power Company at Scranton, Pa.

CHARLES H. PARKER, who has been with the Edison Electric Illuminating Company of Boston for the last 23 years, has been appointed superintendent of the generating department, of which he has been assistant superintendent for 17 years.

RUFUS MOSES is now assistant manager of railways of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio. Mr. Moses has been with this company for eight years, successively occupying the positions of storekeeper and freight agent at Sharon, Pa., and then traffic chief and superintendent of freight for the entire system.

OBITUARY.

HARRY SANDERS BALDWIN, Morristown, N. J., cashier for the Public Service Gas Company, Morristown, died December 27, at his home, aged 49 years.

FREDERICK W. MANGER, connected with the Manhattan Electrical Supply Company, 17 Park Place, New York, in the capacity of manager, died December 23, at his home, 47 Bentley Avenue, Jersey City, N. J.

JOHN BEGSTROM, of Rock Island, Ill., who brought the first electric lighting plant to that city and installed one of the first private electric systems in Illinois, died recently. He became interested in the electric light industry in its early infancy and on December 5, 1881, he installed a private electric lighting system in his drug store, which naturally became the subject of discussion for the entire country around that city. When the city electric lighting system was introduced into Rock Island he abandoned his private plant to aid in the installation of a system which the entire town could use.

HARRY G. MCCULLY, a well-known telephone man, died at Orange, N. J., December 30. Mr. McCully was born near Philadelphia 62 years ago. For more than 30 years he was connected with the New York Telephone Company, having been for many years superintendent of its New Jersey lines. He was also a director of several associated companies and was president of the Electrical Securities & Construction Company of Newark. He was a member of the Telephone Pioneers of America.

JAMES L. FOORD, JR., assistant mechanic of the Commonwealth Edison Company's Fisk Street Station in Chicago, died suddenly December 15. He had been with the Commonwealth company since 1915, and last July voluntarily entered the U. S. Navy, at the time of his death being one of the boys of the Great Lakes Naval Training Station. He was only 26 years old, and his father, Lieutenant-Commander James L. Foord, National Volunteers, U. S. N., is one of the best known men in insurance circles, having been with the Hartford Steam Boiler Inspection & Insurance Company for 30 years, and chief inspector in the Chicago territory since 1894. Young Foord was a great favorite with his former comrades at the Fisk Street Station especially and is greatly missed. His home was at 5413 Dorchester Avenue, Chicago.

HENRY A. HERRICK, consulting engineer of the Montana Power Company, died recently in Butte, Mont., while sitting in the lobby of the hotel conversing with his son. He was one of the best known hydraulic engineers in the country and was a member of the engineering firm, Charles T. Main & Company, of Boston. For several years he had resided at Great Falls, Mont., and was consulting engineer in construction of the Thompson Falls dam at Thompson Falls, the Holter dam at Wolf Creek, the Hebgen dam at Madison, the Lower Madison dam and all of the engineering design work of the Montana Power Company. Death is believed to have been caused by the high altitude. He was 61 years old and is survived by his son in Butte, his widow living in Cambridge, Mass., a married daughter in Boston, and a daughter attending school at Lawrence, Mass.

ENSIGN P. W. PAGE was the first of the 1624 enlisted employees of the B. F. Goodrich Rubber Company, Akron, Ohio, to meet death. He was drowned off the coast of England, according to word reaching the company, when his airplane became unmanageable and plunged into the sea. He had been in the service of the United States since May 4, the date of his enlistment. Ensign Page had been in the employ of the Goodrich company since September 3, 1913. He went to the company from Harvard University. He had always been interested in aviation and during his college days made many flights. He remained at Akron until March 10, 1914, when he was transferred to the Cincinnati branch, working out of there as a traveling representative until April 1, 1915, when he became manager of the Portland (Me.) branch. March 6, 1916, he was called to the Boston branch and assigned to cover western Massachusetts and southern Vermont. Shortly after the outbreak of war he resigned his position and entered the naval branch as an aviator. Officials of the Goodrich company, in expressing regret at his death, said he possessed an enviable reputation while with the corporation.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN.

BUFFALO, N. Y.—Fire Chief Bernard J. McConnell recommends placing the fire and police wires underground. The estimated cost is $40,000.

BUFFALO, N. Y.—City Council has completed the installation of a police signal flashlight system in the Third, Seventh and Eighth Precincts, and operation has been inaugurated.

CITY ISLAND, N. Y.—Kyle & Purdy Shipbuilding Company, Fordham street, has had plans prepared for the construction of a one-story power house, about 30x50 feet, in Fordham.

FREDONIA, N. Y.—Fredonia has contracted with the Niagara & Erie Power Company for electric lighting for the streets, parks and public buildings. The contract will continue for five years. The municipal electric lighting plant will be discontinued.

NEW YORK, N. Y.—Hydraulic Electric Company has incorporated with capital of $50,000, to operate a plant for the generation of electricity. Randolph C. Shaw is the principal incorporator.

NEW YORK, N. Y.—Public Utility Investing Corporation has been organized with a capital of $20,000, to engage in the electrical contracting business. Incorporators are: C. A. Grefidge, H. L. Treman and W. E. Nichols, 500 West Eleventh street.

NEW YORK, N. Y.—Electric Welding Company of America has incorporated with a capital of $1,000,000, to manufacture electric welding apparatus. Incorporators are: W. Schenstrom, J. Kjekstad and E. Schwarz, 415 Knickerbocker avenue, Brooklyn.

NEW YORK, N. Y.—The American Syndicate of Industrial Engineering, Inc., has been organized with a capital of $180,000, to engage as electrical, consulting and contracting engineers. Incorporators are: George V. Reilly, S. B. Howard and A. W. Britten, 65 Cedar street.

NEW YORK, N. Y.—City has commenced the installation of its fire alarm system, and it is expected that the work will be completed at an early date. It is said that the new system will be one of the most complete in the world, and the present number of circuits will be quadrupled.

NEW YORK, N. Y.—Electric Reduction Company, 50 East Forty-first street, has filed notice with the Public Service Commission of an increase in its capital from $100,000 to $500,000 to provide for extensions, improvements, etc.

NORTH TONAWANDA, N. Y.—Tonawanda Power Company has filed notice with the Public Service Commission of an increase in its capital from $250,000 to $750,000, for expansion.

ROCHESTER, N. Y.—Rochester Railway & Light Company has filed notice with the Public Service Commission of an increase in its capitalization from $10,250,000 to $17,250,000, to provide extensions, improvements, etc.

TONAWANDA, N. Y.—Fore River Shipbuilding Company, 97 East Howard street, Quincy, Mass., has awarded a contract for the construction of a one-story power house and machine shop, about 200 x400 feet, at its local works on Vulcan street. The Aberthaw Construction Company, 27 School street, Boston, Mass., is the contractor.

SALAMANCA, N. Y.—Board of Water, Light & Power, City Hall, has awarded a contract to G. F. Miller & Son, 58 East Elm street, for the construction of an addition to the municipal lighting plant. C. C. Cheney is city engineer.

JAMESBURY, N. J.—New Jersey State Home for Boys is having plans prepared by F. H. Bent, State House, Trenton, for the installation of a new heating system in the institution to cost about $5000.

JERSEY CITY, N. J.—Boulevard Commission is planning for extensive improvements in its electric lighting system on the boulevard, and has ordered plans prepared for the installation of a large number of lighting units of incandescent type, having an illumination of 400 candlepower each.

JERSEY CITY, N. J.—Public Service Electric Company has submitted a bid to the Boulevard Commission for supplying service for the electric street lighting system on the boulevard at the rate of about $30,300 per year.

MATAWAN, N. J.—Board of Education is making rapid progress in the installation of a heating system in its high school building. The Atlantic Heating & Ventilating Company, Hempstead, N. Y., is the contractor.

MATAWAN, N. J.—Borough Council is considering the installation of electric pumping machinery at the municipal water works.

NEWARK, N. J.—Butterworth-Judson Company, Avenue R, has taken out a building permit for the construction of a one-story power house at its works to cost about $18,000.

NEWARK, N. J.—Public Service Electric Company has awarded a contract to the H. W. Johns-Manville Company, New York, for improvements in its power plant at Point-No-Point, to cost $22,000.

NEWARK, N. J.—State Board of Public Utility Commissioners has approved the application of the Public Service Railway Company for permission to issue stock for $1,250,000 to provide for improvements, etc.

WEST ORANGE, N. J.—Due to the acute shortage of coal, the plant of Thomas A. Edison, Inc., has been compelled to suspend operations until relief is in sight. As a result over 5000 employes are idle.

BEAVER FALLS, PA.—Beaver County Light Company has entered into a contract with the Borough of New Brighton, Beaver County, for a supply of electric lighting for the streets and highways of the borough for a term of three years, and has submitted same to the Public Service Commission for approval.

ERIE, PA.—General Electric Company contemplates the expenditure of $1,000,000 in this city for the building of homes, apartments and flats for its employes. Mathew Griswold, Jr., manager of the Erie plant, states that plans of the company are not sufficiently well developed to announce the exact size and type of building, but will be in a short time.

HARRISBURG, PA.—City has passed the ordinance recently introduced providing for the consolidation of the lighting, fire and police alarm bureaus into one department, to be known as the City Electrical Bureau. The new department will be under the supervision of City Electrician Clark E. Diehl.

HARRISBURG, PA.—Council has made a requisition for an appropriation of $68,833 for electric street lighting for a section of the city, in its budget for 1918.

HAZLETON, PA.—Fire, on January 1, destroyed a portion of the plant of the Harwood Electric Company, completely disabling one of its large turbines. The loss is estimated to be about $25,000. The company has recently received a contract from the Town Council of Catawissa, for supplying electric service for its street lighting system, and is rushing the construction of the necessary lines, etc., to that town.

LANCASTER, PA.—Edison Electric Company has filed notice with the Public Service Commission of an increase of $7500 in common stock, to be issued in part payment for the acquirement of the Akron Electric Light & Power Company.

MANAYUNK, PA.—Glen Willow Ice Manufacturing Company, 4517 Main street, Manayunk, has awarded a contract for the construction of a two-story brick and reinforced concrete power house, about 35x75 feet. The Brown Construction Company, 4600 Main street, Manayunk, is the contractor.

PHILADELPHIA, PA.—Bell Telephone Company, Seventeenth and Arch streets, is taking bids for the proposed alterations and additions to its administration building at Eleventh and Filbert streets.

PHILADELPHIA, PA.—F. A. Poth & Sons, Inc., Thirty-first and Jefferson streets, have awarded a contract for the construction of a power house addition at their plant to cost $18,000. Charles Casper, Horner Building, Philadelphia, is the contractor.

DOVER, DEL.—Messer & Zuber Manufacturing Company has incorporated with a capital of $200,000, to manufacture automatic signal lights for automobiles, etc. Incorporators are S. N. Messer, L. F. Zuber and F. J. Rooks, Brookville, Fla.

BALTIMORE, MD.—Consolidated Gas, Electric Light & Power Company, with offices at Lexington and Liberty streets, will build an electric substation on Customhouse avenue to serve as downtown distributing station.

BALTIMORE, MD.—Consolidated Gas, Electric Light & Power Company, Lexington Street Building, is planning for the immediate construction of an electric substation on Customhouse avenue, to serve as the downtown distributing station.

INDIAN HEAD, MD.—Bureau of Yards and Docks, Navy Department, Washington, D. C., has awarded a contract to the Austin Company, Bulletin Building, Philadelphia, Pa., for the construction of its proposed local power house, at $40,000.

RISING SUN, MD.—City has sold a bond issue for $8000 for improvements in its electric-lighting plant.

WASHINGTON, D. C.—Under authority of the President, the electric power produced, imported and distributed by the Niagara Falls Power Company, the Hydraulic Power Company of Niagara Falls, and the Cliff Electrical Distributing Company, were requisitioned by the government recently to assure adequate supply of electric power for establishments engaged in war work at Niagara Falls and Buffalo.

CHARLESTON, W. VA.—A large powder plant will be established here by the War Department to cost between $20,000,000 and $30,000,000, and employing thousands of men. Construction work will start soon. Address Secretary of War Department, Washington, D. C.

GRAPHITEVILLE, N. C.—General Graphite Company, Jefferson Bank Building, Birmingham, Ala., is planning for the construction of a hydroelectric power plant at its local works.

RANDLEMAN, N. C.—Laurel Power Company has incorporated with a capital of $125,000. A. C. Hammer, M. F. Hinshaw and others are the incorporators.

SOUTHERN PINES, N. C.—John T. Patrick is considering the construction of a hydroelectric power plant to generate electricity for light, heat and power purposes.

TUXEDO, N. C.—Blue Ridge Power Company, of Spartanburg, S. C., is building a hydroelectric plant here to cost

from $800,000 to $900,000. This water power electrical development will generate from 8000 to 10,000 horsepower for distribution over the 40-mile transmission system to furnish electricity for Campobello, Inman, Landrum and Spartanburg in South Carolina, and Saluda and Tryon in North Carolina.

AMERICUS, GA.—The contract between the Americus Lighting Company and Americus expires shortly and as the company is said to be asking an unprecedented increase in the price charged for furnishing street lights under a proposed new contract, there is a movement on foot to establish a municipal-owned plant. Philadelphia capitalists own the Americus plant and recently had added a number of improvements to the equipment.

AUGUSTA, GA. — Whitney-McNeill Electric Company has incorporated with a capital of $6000, to manufacture electric fixtures. Incorporators are J. B. Whitney and J. B. McNeill.

GAINESVILLE, GA. — The Southern Bell Telephone & Telegraph Company has awarded a contract to A. J. Krebs & Son, Atlanta, for the construction of an exchange plant, the installation of an electric underground conduit system to replace the present overhead wires, and work in connection with the changing of all stations to the drop system. Estimated cost, $50,000.

NORTH CENTRAL STATES.

CANTON, OHIO.—Plans for the construction of a new plant for the recent consolidated Republic Rubber Corporation are under way and construction will begin this spring. The building will be three stories high, with modern machinery and will cost $500,000. H. M. Geiger, president of the Geiger-Jones Company, handled the merger.

CINCINNATI, OHIO. — Council has granted a franchise to the Cincinnati Lawrenceburg Aurora Electric Company to build lines from Cincinnati to Anderson's Ferry.

COLUMBUS, OHIO.—American Water Motor Company, 108 West Spring street, has bought a site in the western part of the city on which it will erect a new and modern factory in the spring. Lewellyn Lewis is president and E. A. Lewis, secretary and treasurer.

DAYTON, OHIO.—Domestic Engineering Company has taken steps toward increasing its capital stock from $800,000 to $3,500,000. The firm has sold and shipped to all parts of the United States and Canada in the last year 40,000 plants, and it is proposed to extend sales into every foreign country. The officers are: Col. Edward A. Deeds, president; Charles F. Kettering, vice-president; R. D. Funkhouser, secretary and treasurer, and R. H. Grant, sales manager.

PENINSULA, OHIO.—An electric power house will be built here by the Moody & Thomas Milling Company to replace the one recently destroyed by fire.

SALINEVILLE, OHIO.—A bond issue of $25,000 for the purchase of the Salineville Electric Light, Heat & Power Company has been authorized by popular vote.

TOLEDO, OHIO.—Mutual Heating & Light Company has been awarded a 25-year franchise to construct a conduit system for steam pipes and electric wiring on Michigan street. A bond issue of $800,000 for the construction of the new intercepting sewer was also authorized.

FORT WAYNE, IND.—The board of public works is considering plans for extensions to the municipal electric light plant, involving an expenditure of about $25,000. If plans are approved, it is understood that bids will be asked for the new building at once.

LAFAYETTE, IND. — Brassie-Bowers Electric Company has incorporated to manufacture electrical appliances. The capital is $5000 and the incorporators are Ralph E. Bowers, Lloyd M. Bowers, Ralph A. Brassie.

CHICAGO, ILL.—The council local transportation committee has directed Corporation Counsel Ettelson to prepare ordinances empowering Chicago surface lines to extend its tracks in Monroe street from La Salle to Canal. Several car lines will be rerouted on this line.

ROCKFORD, ILL.—Rockford Electric Company during 1917 spent $150,000 for improvements, including a new boiler and a distribution line to Camp Grant.

STAUNTON, ILL.—The car barns and repair shops of the Illinois Traction System were partly destroyed by fire recently; loss, $35,000.

BATTLE CREEK, MICH.—A committee has been appointed which provides for investigation of the Citizens' Light & Power Company's plant, with a view toward purchasing it. Address Commissioner A. J. McPeake.

GRAND RAPIDS, MICH. — Monarch Storage Battery Company has incorporated with a capital of $20,000. The incorporators are T. H. Lavier, A. B. Knowlson, H. G. Dykhouse, David Runyen, Charles E. Cartier, G. J. Rooks and E. C. Nichols.

AMHERST, WIS.—Amherst Electric Service Company has petitioned the board of trustees of Amherst Junction to grant it a 10-year franchise for an electric light, heat and power plant in Amherst Junction. The privileges which the Amherst Electric Service Company asks are the use of the public streets, highways and alleys of Amherst Junction for the erection and maintenance of its poles, wires and other apparatus for the transmission of electric current to and through Amherst Junction; that the village take not less than six street lights consisting of type C nitrogen lamp of 400-candlepower or a light equivalent thereto; that Amherst Junction pay the company the sum of $500 to aid such company in constructing said plant and in consideration of which payment the company agrees to charge the same rates for street lighting and electric current for other purposes as the Railroad Commission of Wisconsin may fix and allow as a proper charge for such service in Amherst.

BEAVER DAM, WIS.—Wisconsin Power, Light & Heat Company is preparing plans for the construction of transmission lines here.

DE PERE, WIS.—Western Steel & Manufacturing Company is considering the extension of plant and power house to cost $25,000.

SHEBOYGAN, WIS. — Badger State Tanning Company will erect an addition to its power house. Architects Juul & Sixta, Sheboygan, have prepared plans.

STEBBINSVILLE, WIS.—Porter Electric Line Company has incorporated with the intention of developing the water power here and furnished electricity for rural districts. Address Fred Miller, president of the company.

WAUSAU, WIS.—Work on the large boiler room and concrete smokestack at the Wisconsin Valley Electric Company's plant is progressing and is expected to be completed by February 1. Work on bricking in the boilers has been started and the automatic Westinghouse stokers are all set.

VIRGINIA, MINN.—Architect C. E. Nystrom has been authorized to advertise for bids for the electrical work incident to completion of the new school building. It is believed the contract will amount to considerably over $10,000.

CEDAR RAPIDS, IOWA.—Iowa Telephone Company will improve telephone exchange and install approximately 30 blocks of conduits, tile, etc., to cost $40,000. Address J. M. Rider, manager, 319 South Second street.

SUMNER, IOWA.—Power transmission line will probably be constructed between Sumner and Tripoli.

CAMERON, MO.—The city council is contemplating improvements to the municipal electric light plant.

FOREST CITY, MO.—Steps have been taken by local business men for the installation of an ornamental lighting system in the business district. Electricity for operating the system will be obtained from St. Joseph.

PLATTSBURG, MO.—Clinton County Telephone Company will issue $15,000 worth of bonds for making improvements.

ST. JOSEPH, MO.—City plans to improve its electric lighting plant. Estimated cost, $31,000. H. Judson, city engineer.

BURNS, KANS.—City voted December 27 on $10,000 bonds for electric light plant.

BROKEN BOW, NEBR.—The installation of a new engine at the municipal electric light plant is under consideration.

FAITH, S. D.—The installation of a municipal electric light plant in Faith is reported to be under consideration.

SOUTH CENTRAL STATES.

OWENSBORO, KY.—Owensboro Home Telephone & Telegraph Company has awarded contracts for improvements in its plant, including a new switchboard, equipment, etc., to cost $50,000.

BIRMINGHAM, ALA.—The new hydroelectric power line of the Alabama Power Company into Roanoke was opened recently. The line will not only furnish the municipality with electric current, but will also furnish the mills of Roanoke with current.

ARKADELPHIA, ARK. — Arkansas Light & Power Company has announced the removal of its general offices to Pine Bluff. H. C. Couch is president.

PENROSE, ARK. — Arkansas Valley Railway, Light & Power Company has started construction of a transmission line to serve Penrose.

STUTTGART, ARK.—S. R. Morgan & Company, Little Rock, are planning for the construction of an electric-light and power plant.

STUTTGART, ARK.—S. R. Morgan & Company, of Little Rock, have franchise

DATES AHEAD.

American Institute of Consulting Engineers, Inc. Annual meeting January 14. Secretary, F. A. Molitor, 35 Nassau Street, New York City.

Electrical Contractors' Association of State of Missouri. Annual convention, January 19. Secretary, A. J. Burns, 318 West Tenth Street, Kansas City, Mo.

Minnesota Electrical Contractors' Association. Annual convention, Minneapolis, Minn., January 21. Secretary, G. M. Jones, 112 South Seventh Street, Minneapolis.

Northern White Cedar Association. Twenty-second annual meeting. Hotel Radisson, Minneapolis, Minn., January 22-23, 1918. Secretary, N. E. Boucher, 743 Lumber Exchange, Minneapolis.

Western Association of Electrical Inspectors. Annual meeting, Memphis, Tenn., January 29-30-31. Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago, Ill.

Illinois Electrical Contractors' Association. Semi-annual convention, Chicago, February, 1918. Secretary-Treasurer, L. B. Van Nuys, 238 South Jefferson Avenue, Peoria, Ill.

Vermont Electrical Association. Annual meeting, February, 1918. Secretary-Treasurer, C. H. West, Rutland, Vt.

National Association of Electrical Inspectors. Annual convention, New York, March, 1918. Secretary-Treasurer, William L. Smith, Concord, Mass.

Wisconsin Electrical Association. Annual meeting, March, 1918. Secretary, George Allison, 1419 First National Bank Building, Milwaukee, Wis.

Southwestern Society of Engineers Annual meeting, April, 1918. Secretary, C. E. Bargiebaugh, 703 First National Bank Building, El Paso, Tex.

Kentucky Association of Electrical Contractors. Annual meeting, May, 1918, Louisville, Ky. Secretary, F. F. Valinoti.

Texas State Association of Electrical Contractors. Annual meeting, Galveston, Tex., June 15, 1918. Secretary, H. S. Ashley, Fort Worth, Tex.

Georgia Electrical Contractors' Association. Annual meeting, June, 1918, Tybee Island, Ga. Secretary, Dan Carey, Atlanta Builders' Exchange, Atlanta, Ga.

to operate electric light and power plant.

BARATARIA BAY, LA.—Until January 21, the United States Government, Bureau of Yards and Docks, will receive bids for the installation of radio towers and tank. The estimated cost of the work is $35,000.

KENNER, LA.—The city is planning for a bond issue of $10,000 for improvements in its lighting plant. Paul Felix is mayor.

LAVERNE, OKLA.—Bond issue of $13,000, for constructing electric light plant, carried at recent election.

LAWRENCE, OKLA.—Bonds to the amount of $13,000 have been voted to purchase the electric lighting system.

LOCO, OKLA.—Farmers' Mutual Telephone Company has been organized with J. D. Parsons, president, and James Duncan, secretary.

WOODWARD, OKLA. — Citizens will vote on a bond issue of $20,000 for constructing electric lighting plant.

McALLEN, TEX.—Rio Grande Public Service Corporation will install additional machinery and equipment for its electric light and power plant here, at a cost of about $40,000.

MIAMI, TEX.—Empire District Electric Company has increased its capital from $30,000 to $200,000.

NACOGDOCHES, TEX. — The city council is considering installing additional electric light plant. It is proposed to double the output of the plant.

SABINAL, TEX.—R. T. Robinson, of San Antonio, has purchased the electric light and power plant and ice factory of the Sabinal Light & Ice Company. He will enlarge and make other improvements to the property.

SAN BENITO, TEX.—Commonwealth Electric Light & Water Company will enlarge its power house and install a new 100-horsepower engine and other equipment in its electric light and power plant here.

WESTERN STATES.

REDSTONE, MONT.—New machinery will be purchased for the lighting plant. Address S. J. Dorothy.

BOISE, IDA.—Council has passed ordinance providing for the installation of a system of ornamental 250-candlepower nitro-filled mazda lights in district No. 2.

SEATTLE, WASH.—An electrically operated steel plant will be erected on Puget Sound, near here, as a result of the choice made by the Alaska Gastineau Mining Company in choosing a site for its recently formed company. The enterprise is said to involve the sum of $25,000,000, of which $9,000,000 will be spent on the plant's first unit. Work is expected to begin shortly. The concern is composed of a number of San Francisco financiers, among whom are B. L. Thane, S. F. B. Morse, W. H. Crocker and others.

SEATTLE, WASH.—Corporation Counsel Hugh M. Caldwell and J. D. Ross, superintendent of lighting, will go to Washington, D. C., to represent the city of Seattle in its application for a permit to construct a hydroelectric plant in the Washington National Forest. If the permit is issued the board of public works will call for bids for a completed plant on the federal domain, a transmission line and a substation in the city limits, the entire work to cost not more than $5,000,000.

SEATTLE, WASH. — Loyal Heights line, an electric road owned by Harry Whitney Treat, has been taken over by Seattle for $40,000, same to be paid for out of railway extension bonds of an issue of $125,000 recently authorized. Linking up of the Loyal Heights line with projected extension of Division A into Ballard will carry the line to the north city limits.

SEATTLE, WASH.—Plans are being prepared and bids will be asked in a month for the construction of a new substation for Seattle's lighting department at West Forty-ninth street and Fourteenth avenue to cost $75,000. Daniel Huntington, city architect.

PORT GAMBLE, WASH.—Puget Mill Company is preparing to install a 1000-kilowatt steam turbine unit, contract for which was placed with the Allis-Chalmers Manufacturing Company. A. B. Pracna, of Seattle, is the consulting engineer for the Puget Mill Company.

SPOKANE, WASH.—Washington Water Power Company's entire $2,800,000 all been subscribed. Of the total, $500,000 has been taken up in Spokane, with $250,000 more requested. The remainder has been taken or subscribed by eastern capitalists. The notes, which were in $1000 to $5000 denominations, bearing 6 per cent interest, sold at 1 per cent below par, thus giving purchasers 7 per loan on short-term notes of one year has cent. The loan was floated to refund on existing notes to provide for additional extensions in the Coeur d'Alene and other localities necessitated by the number of electric ranges being used and to complete work already under way.

TACOMA, WASH.—City has bought 10 street cars for use of its municipal lines at a cost of $3000 each.

BRUSSELS, ONT.—Town plans installation of electric light plant.

PORTLAND, ORE.—The following bids were received by the Dock Commission for supplying 42 motors from 100 horse power to those of smaller sizes, also for a number of transformers: Fairbanks, Morse Company, on motors only, $26,178; Westinghouse Electric & Manufacturing Company, motors, $27,900, transformers, $3675; General Electric Company, motors, $29,278, transformers, $3774; Western Electric Company, same figures as the General Electric Company; Allis Chalmers Manufacturing Company, motors, $27,550, and transformers, $3930.

INCORPORATIONS

PORT ARTHUR, TEX.—Port Arthur Telephone Company. Capital, $100,000. To operate a telephone exchange plant. Incorporators: R. S. Shipley, J. W. Williams, Port Arthur, and P. K. Higgins, Liberty, Mo.

MEMPHIS, TENN. — Lalley Electric Farm Light Company. Capital, $10,000. Incorporators: G. T. Taylor, J. A. Goodman, Lamar Heiskell and Frank S. Elgin.

DAYTON, OHIO — Dayton Electrical Manufacturing Company has incorporated with a capital stock of $125,000. H. G. Catrow and others are the incorporators.

PLEASANT HILL, MO.—Green Light & Power Company has incorporated with a capital stock of $150,000 by L. K. Green, L. R. Green and others.

OZARK, MO.—Finley Light Company has incorporated with a capital stock of $10,000. George T. Braezale, F. W. Barrett and D. W. Bingham are the incorporators.

GARWOOD, N. J.—Aircraft Specialties Company has incorporated with a capital of $25,000 to manufacture electric motors. The incorporators are William B. Elliott, William Siebenmorgan and George A. Elliott.

WILMINGTON, DEL.—Electro Products Corporation has been incorporated with a capital of $500,000. It will manufacture machines under electrolyte chemical and other processes. The incorporators are M. L. Horty, L. A. Irwin and Harry W. Davis, of Wilmington.

SEATTLE, WASH.—Electric Manufacturers' Agency has filed articles of incorporation with a capital of $20,000. The incorporators are Joseph Schoemer, Geo. Buckman and W. Funfsinn.

WILMINGTON, DEL. — E. R. Kibler Company has incorporated with a capital of $200,000 by C. L. Rimlinger, C. M. Egner and M. M. Clancy.

ABILENE, TEX. — The West Texas Utilities Company has been incorporated with a capital stock of $400,000 by George W. Williamson, 72 West Adams Street, Chicago, Ill.; J. M. Dickie, J. F. Meadows and F. A. Matthes, all of Abilene; A. Hargrave and Sidney G. Vigo of Dallas. The company has taken over the properties of the Abilene Gas & Electric Company, the Baird (Tex.) Gas & Electric Company, and the Hamlin (Tex.) Gas & Electric Company.

MARSHALL, TEX.—The East Texas Utilities Company has been chartered with a capital stock of $300,000 and has acquired the holdings of the Marshall Electric Company, the Marshall Traction Company and the Marshall Ice Company; the Jefferson (Tex.) Ice & Light Company and the Longview (Tex.) Ice & Light Company. The incorporators are George W. Williamson, 72 West Adams Street, Chicago, Ill.; J. M. Dickie, J. F. Meadows and F. A. Matthes, all of Abilene; A. Hargrave and Sidney G. Vigo of Dallas.

PROPOSALS

ELECTRIC LIGHTING SYSTEM.—Bids will be received until 11 a. m., January 14, by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for an electric lighting system for the extension of machine-shop building No. 128 at the navy yard at New York City.

ELECTRIC FREIGHT ELEVATOR.—Bids will be received until 11 a. m., January 14, by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for one electric freight elevator of two-ton capacity for building No. 45 at navy yard in Portsmouth, N. H.

ELECTRIC LIGHT AND POWER SYSTEM.—Bids will be received until 11 a. m., January 21, by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for constructing two 125-ft. steel towers; one 12,000-gal. water tank, dormitory building (19 ft. by 53 ft. 6 in.) and receiving building (19 ft. by 25 ft.), both wood frame, one story; water, electric light and power, and sewerage systems, at Naval Radio Station, Barataria Bay.

NEW PUBLICATIONS

QUARTERLY METALS JOURNAL.—The American Institute of Metals, 10 Depot street, Concord, N. H., has published its quarterly journal, dated December, 1917. This quarterly contains a summary of the proceedings of the Institute's eleventh annual, the President's address, and some of the subjects treated are: "The Amorphous Metal Hypothesis and Equi-Cohesive Temperatures," by Zay Jeffries; "The School End of the Job in Training Foundrymen," by Clifford B. Connelley; "Notes on the Crucible Situation," by A. V. Bleininger; "The Use of Bronzes in Railroad Turntables and Movable Bridges," by O. E. Selby; "Melting Brass in the Induction Furnace," by G. H. Clamer; "Note on the Question of Fluxes," by H. M. Lane, and many other interesting subjects are discussed.

ELECTRICITY IN RUBBER FACTORIES.—"Electrical Equipment for Rubber Factories" is the title of an elaborately illustrated publication (circular No. 7352), with an attractive art cover, which has been issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The advantages of motor drive, particularly for the calender, are explained in some detail, and a number of views of different motors and control are shown. A large number of illustrations of application of motors to the rubber industry, taken in different parts of the country, are used. The equipment of the Howe Rubber Company, New Brunswick, N. J., is featured and a number of illustrations of this up-to-date plant are shown.

ELECTRICAL EQUIPMENT FOR TEXTILE INDUSTRY.—The application of electricity to the textile industry is thoroughly described and illustrated in circular No. 7153, entitled "Electricity in the Textile Industry," just issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. It was distributed at the Southern Textile Exposition at Greenville, S. C., December 10-19. The publication is profusely illustrated with applications of electric motors to the industry, a number of views being shown illustrating the different methods of drive employed in textile mills. Considerable space is devoted to lighting, which is an important feature in all industrial establishments, especially textile ones. This book will be sent free on application to any one interested.

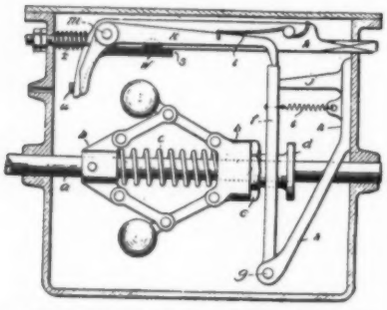
Recent Patents

Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Loosening Tomato Skins (1,250,140).—According to this patent to William H. Chapman, of Portland, Maine, Mr. Chapman is no longer confining his efforts to the neutralizing of static charges on printing presses, for which purpose his apparatus has been widely introduced. He has now turned to electrical means for facilitating the pealing of tomatoes. With this in mind, he provides a simple apparatus for puncturing the skin of the tomato at a large number of points by electric sparks.

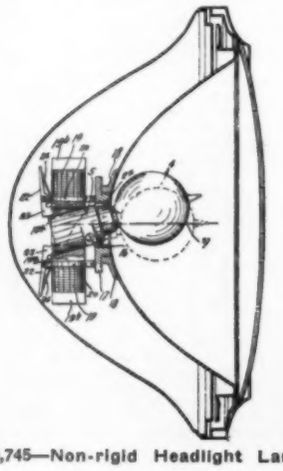
Checking Automobile Speeding (1,250,290).—Issued to an Australian, this patent shows that the problem of



1,250,290—Speed-Check for Automobile.

controlling vehicle speeds is by no means a purely American issue. For this purpose the inventor (Richard A. Duncan, of Adelaide, South Australia) connects a centrifugal governor to the motor of the vehicle and adjusts the governor for actuating a switch when it reaches a certain speed, thereby cutting off the ignition current from the spark plugs.

Headlight (1,250,745).—Instead of fastening the lamp socket in rigid alinement with the axis of the headlight reflector, Overton Winston, of Minneapolis, Minn., mounts the socket on a pivot behind the reflector and below its axis, so that the lamp can swing in a vertical plane to a limited extent.



1,250,745—Non-rigid Headlight Lamp.

Excess-Pressure Indicator (1,250,210).—This switch patent, assigned by H. Y. Norwood and F. K. Taylor to the Taylor Instrument Companies, of Rochester, N. Y., shows a device for closing a circuit when the pressure of a fluid reaches a certain point. The movable switch member is mounted on a piston which is forced toward the circuit terminals against the pressure of a spring.

Making Hollow Metal Bodies (1,250,802).—In this patent and in No. 1,250,803, Edward G. Cook, of Long Island City, N. Y., describes a method and an apparatus for making hollow metal bodies. He first fills a mold with lead or other fusible metal, chills the mold so as to solidify the surface portions of the lead, and drains the unchilled lead out of the interior of the shell thus formed. Then he uses this shell as a core on which he deposits a metal of a higher melting point electrolytically, and afterwards heats the plated body to remove the lead core from it.

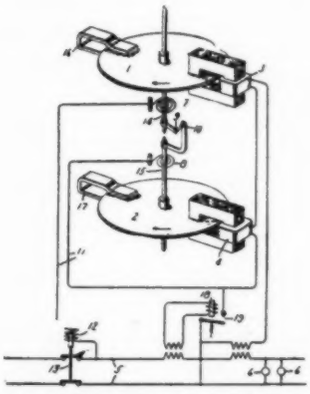
Guy-Rod Anchor (1,250,350).—Issued to Chester R. Pieper, of La Crosse, Wis., on an application filed in 1914, this patent shows a drive anchor with blades pivoted to the shank and adapted to fold against this shank. The point or pilot broadens from its tip to an area greater than that of the folded blades, so as to clear the way for the inserting of the latter in the ground.

Reclaiming Old Friction Tape (1,250,418).—Judging from the patent assigned by Russell D. Belden to the Miller Rubber Co., of Akron, Ohio, old and dried friction tape may be worth preserving and selling, since he mentions vulcanized scrap friction fabric as one of the ingredients of a new plastic composition for shoe soles.

Incandescent Lamp (1,250,815).—Relates to a tungsten-filament lamp having a "getter" within the bulb consisting of phosphorus and cupric oxide. The patent, issued to Dorsey and Blake on an application filed nearly four years ago, is assigned to the General Electric Co.

Pipe-Grounding Clamp (1,250,467).—To make a single size of clamp adjustable for different sizes of pipes, Frederick I. Johnson, of Warren, R. I., makes a wire terminal in the form of a saddle. This saddle is strapped to the pipe by a flexible band having a series of holes which afford the needed adjustment.

Time-Limit Relay (1,250,806).—Two disks, rotated after the manner of electric meter disks, carry contacts and are so arranged that the contact on one overtakes that on the other when the actuating current exceeds a

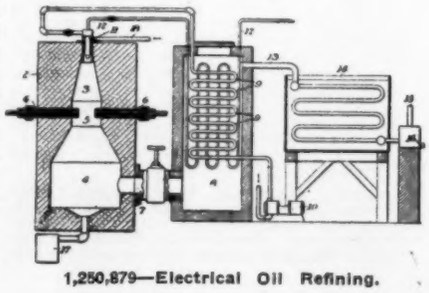


1,250,806—Time-Limit Relay.

predetermined amount. Shown in a patent assigned by James R. Craighead to the General Electric Co.

Electric Lamp Fixture (1,250,581).—To prevent a wabbling or lateral movement of the shade supporter in an indoor lighting fixture, Gustave A. Harter (of the Harter Mfg. Co., Chicago) provides a removable ring which has a shoulder engaging a portion of the shade supporter.

Oil Refining (1,250,879).—According to this patent, Leon C. Hirt, of Los Angeles, Cal., employs an electric arc in a closed chamber as part of the means for fractioning hydrocarbon oils. The oil is preheated and is passed within a closed chamber (in which a controllable pressure is maintained) through a zone containing the electric arc, chlorine gas being also supplied to the chamber.



1,250,879—Electrical Oil Refining.

Financial News

BANKERS REPORT ON PUBLIC SERVICE SECURITIES.

At a recent convention of the Investment Bankers' Association of America the public service securities committee was instructed to prepare a report covering the situation with respect to securities of this character. In part this report is as follows:

No class of securities is more widely distributed than the bonds and stocks of electric railway, gas and power and light, telephone and other public utility companies. The average holdings are small, and while very large amounts of utility securities are held by the insurance companies and savings banks, they are also widely distributed in the smallest denominations among a multitude of individual investors. More than $4,500,000,000 are invested in electric plants, nearly $5,000,000,000 in electric railways, $3,500,000,000 in gas plants, $1,500,000,000 in telegraphs and telephones and probably a half million more in equipment and supplies for these utilities in the hands of dealers—a total of $15,500,000,000 of the people's savings devoted to the conservation of energy in the public service.

General Electric Increases Capital.

General Electric Company stockholders at a special meeting recently ratified the proposed increase in capital stock by $20,000,000. If the official estimates of the General Electric management are verified by the full returns the company in its fiscal year ending December 31 will roll up the record profit of $27,000,000, a sum nearly $8,000,000 larger than in 1916.

AMERICAN TELEPHONE & TELEGRAPH COMPANY NOTES.

To provide funds to meet extraordinary expenditures for the war requirements of the government the American Telephone & Telegraph Company has sold $40,000,000 one-year 6 per cent notes to a banking syndicate, it was announced recently. Part of the proceeds to the amount of $18,000,000 will be used to meet maturing obligations of subsidiary companies, but the balance will provide cash for the war need improvement.

Investors are being offered $10,500,000 Toledo Traction Light & Power Company 7 per cent two-year gold bonds at 98½ and interest, offering a yield of 7.82 per cent. Offering is being made by a syndicate headed by the Harris Trust & Savings Bank and the National City Company. Toledo Traction does practically the entire electric light and power and street railway business in Toledo, Ohio.

Copper Prices.

Advices from Washington state that the present copper prices, fixed by the Government, will continue until January 21. On that date they will either be continued or revised. Details are being looked into, but final decision may not be announced until a near date, to which the present prices carry.

Copper Output at Upper Lakes.

With the end of 1917 it became more and more apparent that there would be a large decrease in the total copper production of the Lake Superior camp from the figures of 1916—considerably more than 10 per cent. It has been predicted that the district would get out a total of from 225,000,000 to 230,000,000 pounds of copper in 1917, but brief study of the first ten months' output for the larger mines would seem to indicate that not more than 220,000,000 pounds, if that much, has been manufactured.

The big problem in the way of getting out a big production of copper has been the labor shortage, first trouble with which was experienced during the last few months of 1916. The shortage did not become really serious till March or April of last year, however. It was believed, early in the year, that embargoes and car shortage would hold up the copper production to some extent, but the opening of lake navigation in the spring took out the big surplus of manufactured copper on hand and greatly helped the situation.

The labor shortage continues, although it has been a much less bothersome problem the last two months than during the warm months of summer. Some of the smaller mines and prospects have closed and others plan to do so for the winter, releasing a number of experienced workmen to the larger mines, while thousands of new men have been brought in. Where thousands have been imported, however, only hundreds have stayed with the mining companies, and men are going out daily, although at a smaller rate than a month or so ago.

The probability that the mining companies, despite the government regulated price of copper, will continue to pay bonuses and extra percentage on the wages after the first of this year is holding many men who otherwise would leave the district. None of the companies has announced, to date, that these bonuses will be continued, however. In the cases of most companies the agreements on bonus payments will expire the first of 1918.

Just what the Government will do when the period for which copper has been ordered sold at 23½ cents comes to an end is another bothersome problem. It is not anticipated that a new low price will be set, however. With many of the larger companies forced to reduce their dividend declarations, it is felt that a further cut in the selling price would mean the suspension of operations, at least serious curtailment, at even some of the larger properties.

Public Utility Dividends.

Directors of the Lindsay Light Company this week increased the regular quarterly dividend on the common stock from 3 to 5 per cent and provided for an extra disbursement on that issue of 15 per cent. In addition the regular 1¾ per cent was declared on the preferred, all payable February 28 to stock of record February 3.

This action is in line with the course of dividends both in 1916 and 1917. The first quarterly dividend in 1916 was increased from 1 to 2 per cent, and the total payments for that year in regular and extra dividends were 13 per cent, the stock being put on a 3 per cent quarterly basis May 31, 1916. Last year 31 per cent. was distributed to shareholders in regular and common dividends. This year, if the 5 per cent quarterly dividend is continued—and there is no reason to suppose otherwise—at least 35 per cent will have been paid when it closes.

Lindsay Light has been enjoying great prosperity in recent years, with a steady expansion. In the fiscal year ended May 31 last net profits were $431,003 and the surplus was $307,003, both figures more than double those of the preceding twelve months. While no official estimates are obtainable, it is expected that in the fiscal year to end May 31 next even the 1916 record will be surpassed.

Crocker-Wheeler Company, electrical machinery manufacturer, of Ampere, N. J., has declared a regular quarterly dividend, for last quarter of 1917, of 1¾ per cent on preferred and 2 per cent on common stock, payable January 15 to stock of record January 5.

Public Service Electric Company of New Jersey has declared a regular quarterly dividend of 1¾ per cent on common and 1½ per cent on preferred stock, payable February 1 to stock of record January 15.

Sierra Electric Company has declared a dividend of $1.50 on preferred stock, payable February 1 to stock of record January 10.

Standard Underground Cable Company has declared the regular quarterly dividend of 3 per cent, an extra of 3 per cent and a special dividend of 9 per cent, making a total of 15 per cent, all payable January 15 to stock of record January 5.

Northern States Power Company has declared the regular quarterly dividends of 1¾ per cent on both preferred and common stock, payable January 21 to stock of record December 31.

Western States Gas & Electric Company has declared the regular quarterly dividend of 1¾ per cent on preferred stock payable January 15 to stock of record December 31.

Ottumwa Railway & Light Company has declared the regular quarterly dividend of 1¾ per cent on preferred stock, payable January 15 to stock of record December 31.

Puget Sound Traction, Light & Power Company has declared its regular quarterly dividend of 1½ per cent on the $14,793,400 preferred stock.

United Railways & Electric Company of Baltimore has declared a dividend of 50 cents a share on the common stock, payable January 15 as registered January 5.

American Light & Traction Company declared regular quarterly dividends of 1½ per cent on the preferred and 2½ per cent on the common stocks and a dividend of 2½ shares of common stock on every 100 shares of common stock outstanding, all payable February 1 to stock of record January 10.

Carolina Power & Light Company declared regular quarterly dividend of ½ per cent on the common stock, payable February 1 to stock of record January 15.

Electrical Utilities Corporation has declared a quarterly dividend of 1¼ per cent on its preferred stock, payable January 15 to stock of record January 5.

United States Rubber Company has declared a quarterly dividend of 2 per cent on its first preferred stock. payable January 31 to stock of record January 15.

Pennsylvania Lighting Company declared the regular quarterly dividend of 1¼ per cent on preferred stock, payable January 15 to stock of record January 2.

Public Service Company of Northern Illinois has declared a quarterly dividend of 1½ per cent on preferred stock and 1¾ per cent on common stock, both payable February 1 to stock of record January 15.

Milwaukee Electric Railway & Light Company has declared a regular quarterly dividend of 1½ per cent on the preferred stock, payable January 31 to stock of record January 21.

Commonwealth Edison Company has declared the regular quarterly dividend of 2 per cent, payable February 1 to stock of record January 15.

Virginia Railway & Power Company has declared regular semi-annual dividend of 3 per cent on the preferred stock, payable January 21.

The West Penn Power Company declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable February 1.

Trustees of the Massachusetts Lighting Company have declared a dividend of $1.50 on the preferred stock and 25 cents on the new common shares, payable January 15 to stock of record December 26.

WESTERN POWER COMPANY.

Western Power Company of Canada, Ltd., reports for November: Operating revenues $41,246, an increase of 11.6 per cent, compared with the same month last year, and net earnings of $31,708, an increase of 32.48 per cent, compared with November, 1916. Net earnings for year 1917 to date are $301,424, compared with $234,059 in 1916. For twelve months ended November, 1917, net earnings are $346,153, an increase of 36.9 per cent over twelve months ended November, 1916.

Reports of Earnings.

EARNINGS OF ALL BYLLESBY PROPERTIES.

Gross and net earnings of all utility properties operated by H. M. Byllesby & Company for the month of November, 1916, and 1917, and the years ended November 30 for the two years named, are reported as follows:

	Gross.	Operating.	Net.
Nov., 1917.	$ 1,825,318	$ 1,052,570	$ 772,748
12 months	19,059,299	10,441,380	8,617,919
Nov., 1916.	1,550,619	778,941	771,678
12 months	16,945,851	8,654,925	8,290,926

PACIFIC GAS & ELECTRIC COMPANY.

	1917.	1916.
November gross	$1,746,026	$1,613,110
*Total income	1,791,396	1,655,903
Net after taxes	589,115	659,530
Surplus after charges.	229,696	322,736
Balance after preferred dividend	105,721	204,386
Eleven months' gross.	18,042,988	16,946,371
*Total income	18,535,280	17,343,277
Net after taxes	6,855,791	7,325,600
Surplus after charges.	2,929,405	3,612,187
Balance after preferred dividend	1,569,068	2,340,568

*Including $11,500 in November, 1917, and $28,395 in November, 1916, involved in rate litigation; $283,390 for 11 months, 1917, and $318,342 in 1916.

REPUBLIC RAILWAY & LIGHT COMPANY.

	1917.	1916.
November gross	$ 464,296	$ 344,943
Net after taxes	136,713	148,859
Total income	144,218	149,109
Surplus after charges.	54,034	78,260
Balance after preferred dividends	28,077	52,303
Twelve months' gross.	4,770,074	3,935,074
Net after taxes	1,566,296	1,663,504
Total income	1,628,368	1,679,404
Surplus after charges.	632,980	862,798
Balance after preferred dividends	321,496	551,314

COLORADO POWER COMPANY.

	1917.	1916.
November gross	$ 108,211	$ 91,497
Net after taxes	64,617	44,931
Total income	66,182	45,900
Twelve months' gross.	1,166,756	1,000,627
Net after taxes	664,562	559,959
Total income	700,092	600,752
Surplus after charges and depreciation	357,244	285,712
Balance after dividends	91,261	29,448

TWIN CITY RAPID TRANSIT COMPANY.

	1917.	1916.
November gross	$ 807,840	$ 848,497
Net	254,297	326,730
Net after charges and taxes	89,785	189,054
Eleven months' gross.	9,345,633	9,290,402
Net after taxes	3,095,159	3,562,961
Surplus after charges.	1,403,816	1,990,408

UTAH SECURITIES CORPORATION.

(Earning of Subsidiary companies.)

	1917.	1916.
November gross	$ 592,304	$ 504,423
Net	311,621	288,668
Twelve months' gross.	6,493,550	5,520,277
Net	3,474,901	3,063,950

NOTHERN STATES POWER COMPANY.

	Gross.	Expenses.	Net.
Nov., 1915	$ 502,888	$ 204,056	$ 298,831
12 months	5,045,692	2,239,585	2,806,106
Nov., 1916	581,254	253,888	327,366
12 months	5,986,130	2,582,209	3,303,921
Nov., 1917	693,204	403,703	289,500
12 months	7,067,199	3,590,859	3,476,339

LOUISVILLE GAS & ELECTRIC COMPANY.

	Gross.	Expenses.	Net.
Nov., 1916	$ 223,483	$ 96,900	$ 126,583
12 months	2,437,799	1,026,190	1,411,609
Nov., 1917	277,747	115,633	162,114
12 months	2,778,115	1,293,705	1,484,410

SAN DIEGO CONSOLIDATED GAS & ELECTRIC COMPANY.

	Gross.	Expenses.	Net.
Nov., 1916	$ 130,077	$ 69,176	$ 60,901
12 months	1,531,995	784,452	747,542
Nov., 1917	161,175	82,521	68,654
12 months	1,572,278	851,573	720,704

WESTERN STATES GAS & ELECTRIC COMPANY.

	Gross.	Expenses.	Net.
Nov., 1916	$ 112,442	$ 55,488	$ 56,954
12 months	1,232,887	638,929	593,958
Nov., 1917	126,944	78,613	48,331
12 months	1,381,363	757,566	623,797

MEXICAN TELEGRAPH COMPANY.

For three months ending December 31:

	1917.	1916.
Gross	$ 385,000	$ 300,000
Net after taxes	279,000	207,750
Total income	329,000	251,385
Surplus	191,123	154,150
Previous surplus	*4,910,881	5,258,248
Total surplus	5,102,005	5,412,198

Above figures partly estimated.
*As adjusted.

PACIFIC GAS AND ELECTRIC COMPANY.

For the eleven months ended November 30 last, net after taxes decreased $469,809; surplus after charges decreased $682,782; balance after preferred dividends decreased $771,300.

LAKE SHORE ELECTRIC RAILWAY.

October—	1917.	1916.
Operating revenue	$ 142,840	$ 136,113
Ten months	1,475,625	1,343,126
Operating expenses	107,995	84,878
Ten months	999,418	838,007
Operating income	34,845	51,235
Ten months	476,207	505,119
Fixed charges	35,321	36,521
Ten months	346,848	363,827
Net income	476	14,714
Ten months	129,359	141,292

BAY STATE STREET RAILWAY.

The income statement of the Bay State Street Railway, Boston, Mass., for the year ended Dec. 31, 1916, follows:

	Amount.	Per cent.	Increase for year.
Operating revenue	$10,413,618	100.0	$854,783
Operating expenses	7,972,800	76.5	740,247
Net operating revenue	$ 2,440,818	23.5	$114,536
Taxes	626,251	6.1	712
Operating income	$ 1,814,567	17.4	$113,824
Non-operating income	62,430	0.6	*1,510
Gross income	$ 1,876,997	18.0	$112,314
Deductions from gross income:			
Rent of leased roads	$ 192,667	1.8	$ 8,524
Interest on funded debt	1,050,774	10.1	14,943
Interest on unfunded debt	68,775	0.7	*40,957
Miscellaneous	30,627	0.3	3,965
Total deductions	$ 1,342,844	12.9	*$ 13,523
Net income	$ 534,153	5.1	$125,836
Dividends:			
First preferred stock	$ 175,951	1.7	$ 11,035
Common stock	102,586	0.9	102,586
Total dividends	$ 278,537	2.6	$113,621
Surplus for year	$ 255,616	3.5	$ 12,215

*Decrease.

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid. Jan. 2.	Bid. Jan. 9.
Adirondack Electric Power of Glens Falls, common	..	15	10
Adirondack Electric Power of Glens Falls, preferred	6	67½	65
American Gas & Electric of New York, common	10+extra	87	87
American Gas & Electric of New York, preferred	6	38	38½
American Light & Traction of New York, common	..	218	220
American Light & Traction of New York, preferred	6	90	90
American Power & Light of New York, common	4	40	40
American Power & Light of New York, preferred	6	71	71
American Public Utilities of Grand Rapids, common	..	27	24
American Public Utilities of Grand Rapids, preferred	6	56	54
American Telephone & Telegraph of New York	..	105	..
American Water Works & Elec. of New York, common	..	4½	4¾
American Water Works & Elec. of New York, particip	7	8	8
American Water Works & Elec. of New York, first preferred	..	57	59
Appalachian Power of Bluefield, common	..	2½	2½
Appalachian Power of Bluefield, preferred	7	18	20
Cities Service of New York, common	+extra	206	212
Cities Service of New York, preferred	6	66 1/6	70
Commonwealth Edison of Chicago	8	102	103
Comm. Power, Railway & Light of Jackson, common	4	31	31
Comm. Power, Railway & Light of Jackson, preferred	6	62	63
Federal Light & Traction of New York, common	..	3	3
Federal Light & Traction of New York, preferred	..	25	25
Illinois Northern Utilities of Dixon	6	76	75
Middle West Utilities of Chicago, common	2+extra	20	26
Middle West Utilities of Chicago, preferred	6	55	56
Northern States Power of Chicago, common	ex.div. 7	60	60
Northern States Power of Chicago, preferred	ex.div. 7	80	85
Pacific Gas & Electric of San Francisco, common	5	30½	27
Pacific Gas & Electric of San Francisco, preferred	6	80	79
Public Service of Northern Illinois, Chicago, common	7	70	74
Public Service of Northern Illinois, Chicago, preferred	6	85	85
Republic Railway & Light of Youngstown, common	4	19	21
Republic Railway & Light of Youngstown, preferred	6	53	63
Standard Gas & Electric of Chicago, common	..	5½	5½
Standard Gas & Electric of Chicago, preferred	6	19¾	20
Tennessee Railway, Light & Power of Chattanooga, common	..	2¼	2
Tennessee Railway, Light & Power of Chattanooga, preferred	6	10½	10½
United Light & Railways of Grand Rapids, common	4	27	26
United Light & Railways of Grand Rapids, preferred	6	58	60
Western Power of San Francisco, common	..	80	80
Western Power of San Francisco, preferred	6	40	40
Western Union Telegraph of New York	extra	87	88
Industrials—			
Electric Storage of Philadelphia, common	4	45	49½
General Electric of Schenectady	8	135	133
National Carbon of Cleveland, common	8	56½	56
National Carbon of Cleveland, preferred	..	130¾	130½
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	41⅝	40¾
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	59	58

*Last sale.